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PROTECCION TECNICA ECOLOGICA (PROTECO) INC.  
PART B PERMIT APPLICATION  
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## SECTION F

PROCEDURES TO PREVENT HAZARDS

This section describes the various procedures used by PROTECO to preclude events that could cause damage to human health and the environment, including general security provisions, facility inspections, preparedness and prevention requirements and handling precautions for ignitable and incompatible wastes. This information is submitted in accordance with the requirements of 40 CFR 270.14(b)(4), (5), (6), (8) and (9), and the Puerto Rico Environmental Quality Board. Other regulations addressed to complete this section include 40 CFR 264.14, 264.15, 264.17, 264.174, 264.194 and 264.226.

F-1 Security Procedures and Equipment [40 CFR 270.14(b)(4)]

It is the intent of PROTECO to keep intruders, livestock, unauthorized personnel, visitors and contractors out of the active portions of the facility so that injury to either humans and livestock does not occur. In providing security measures, PROTECO minimizes the potential for an intruder to cause a release, fire or explosion of waste, mix incompatible wastes, or to damage or disturb the containment and monitoring equipment. PROTECO provides the following measures to ensure the security of the facility:

- 24-hour surveillance system
- artificial and natural barriers
- means to control access
- warning signs.

The following sections describe how PROTECO meets the security objectives required by EPA in 40 CFR 264.14.

F-1a Barriers and Means to Control Entry

F-1a(1) Natural and Artificial Barriers. The entire PROTECO facility is surrounded by both fences and natural barriers. There is only one access road leading to the facility. It is surrounded on either side by a 3.5 foot-high, three (3) strand barbed wire fence. Behind this fence are drainage ditches, vegetation including thorn bushes native to the Puerto Rican southern climate and rolling hills. This fence provides adequate control so that livestock kept adjacent to the western perimeter of the facility cannot pass onto the road leading to the facility.

The entire facility will be surrounded by a five-foot high, five (5) strand barbed wire fence. This fence is shown on Figure B-1.

The only authorized point of entry is at the southern end of the facility where the only access road is located. An eight foot high chain link electric gate topped with three strands of barbed wire is located at this point of entry. This gate is kept closed at all times by the security guards. Access to the facility through this gate by visitors, contractors or transporters of hazardous waste can occur only if security guards have been notified their impending arrival.

Two five-foot high evacuation gates are positioned on the north side of the facility, as shown on Figure B-1. These gates remain locked at all times unless the Emergency Coordinator or his alternate has authorized a site evacuation. The keys to the gates will be kept at the laboratory.

The perimeter of the Tank Farm, Container Storage Building and Stabilization/Fixation Facility is surrounded by an eight (8) foot-high, chain link fence topped by three (3) strands of barbed wire.

Figure B-1 shows the two types of fencing surrounding the facility and the location of the main gate and evacuation gates.

F-1a(2) Means to Control Entry. Security at PROTECO is maintained by a staff of experienced security guards, who primarily monitor the entrance

gate, the entry and exit to and from the active portions of the facility and provide general security measures within the facility premises.

The facility is manned by a security guard 24-hours a day, 7 days per week. Guards normally work an 8-hour shift with a crew of 3 guards per day. Once each day, the security guard using a facility vehicle inspects the entire length of the facility premises checking facility equipment, access point, gates and fencing. Once each week, during the operating hours of the facility, a security guard is responsible for inspecting the entire facility premises checking all the fences, gates and warning signs and recording the findings on a PROTECO inspection log.

All day-time and night-time facility guards are supplied with both walkie-talkies and a facility vehicle having radio-telephone gear. This enables the guards to be in continuous contact with the PROTECO Penuelas office. In the event of an emergency, assistance from the police department, fire departments, civil defense, etc. will be sought by telephone from the PROTECO site office.

Access to the facility by visitors, contractors or outside transporters of hazardous waste can occur only if security guards have been notified of their impending arrival.

An entry log (Figure F-1) has been developed and will be used by the facility. All visitors, contractors and/or outside transporters of hazardous waste will be required to sign the log at the PROTECO gatehouse before entering the facility.

#### F-1b Warning Signs

Warning signs which are legible from a distance of 25 feet are posted on the entrance gate, on the guardhouse and at several fence locations around the facility. These signs are visible from all angles of approach,

# FACILITY ACCESS LOG

F-4

and bear the legend "Danger - Unauthorized Personnel Keep Out". The signs are written in Spanish, which is the native tongue in Puerto Rico (i.e., Peligro Desperdicio Industrial No Se Acergue), and English. The signs have a white background with black lettering that is 2 inches in height. The signs themselves are 12 inches high and 18 inches in length.

No smoking signs which are also legible from 25 feet will be placed on the entrance gate, at various positions around the Containers Storage Facility, throughout the Tank Farm and the Stabilization/Fixation Facility as well as at the Drum Decant Unit and at the entrance to the landfills. Signs are written in either English and Spanish. The signs written in English are for the benefit of any English-speaking visitors and/or contractors visiting the facility as a method to prevent the striking of matches or smoking in hazardous areas. The signs are 18 inches in length and 12 inches in height.

#### F-1c Waiver

PROTECO does not request a waiver from the requirements stated in 40 CFR 264.14(a)(1) and (2) with regard to injury to intruder or violation by intruder.

### F-2 Inspections [40 CFR 270.14(b)(5)]

#### F-2a General Inspection Requirements

A facility that treats, stores or disposes of hazardous waste is required by 40 CFR 264.15 to develop and follow a written inspection schedule.

Inspections of the PROTECO facility are conducted by facility personnel to prevent and/or detect malfunctions and deterioration of equipment, operator errors and/or discharges which would lead to the releases of hazardous waste to the environment or a threat to human health. PROTECO utilizes the inspection plans delineated herein to (1) minimize the potential for release of hazardous waste to the

environment and to (2) ensure that the facility does not pose a threat to human health.

Table F-1 presents the PROTECO schedule for inspecting the facility treatment, storage or disposal operations, the safety and emergency equipment and the security devices. Each inspection that is conducted is recorded on an inspection log specific to the area inspected and includes the following information:

- the date and time of the inspection
- the name of the inspector
- a notation of the observations made
- the date and nature of all remedial action taken.

#### F-2b Inspection Activities for Safety and Emergency Equipment

The PROTECO emergency coordinator or his alternate inspect the safety and emergency equipment at least once each month and after every time it is used in an emergency situation. Table F-1 describes the safety and emergency equipment and the items that are to be checked during the inspection. A copy of the monthly inspection log used by the facility to inspect the safety and emergency equipment is provided in Appendix F.1. Appendix G-3 in Section G provides a copy of the checklist the emergency coordinator uses to inspect and certify the condition of the emergency and safety equipment after it has been used during an emergency situation. Based on the inspection results, the emergency coordinator has the equipment repaired, decontaminated or orders new stock and/or replacement parts.

#### F-2c Inspection Activities for Security Devices

The facility security guards are responsible for inspecting the facility fences, gates, warning signs and the security staff walkie-talkies and radio-telephone equipment on a weekly basis as described in the schedule provided in Table F-1. The security guards will complete a security device inspection log (shown in Appendix F.1) and turn

Table F-1  
INSPECTION SCHEDULE

<u>Area/Equipment</u>	<u>Specific Item</u>	<u>Type of Problems</u>	<u>Frequency of Inspection</u>
Safety and Emergency Equipment	Standard absorbents (Vermiculite, etc)	Depleted stock	Monthly/as needed
	Absorbent boom	Depleted stock	Monthly/as needed
	Absorbent pads	Depleted stock	Monthly/as needed
	Containment drums	Corrosion, structural damage, depleted stock	Monthly
	Emergency shower and eyewash	Water pressure, leaking, drainage	Weekly
	Face shields and goggles	Broken or dirty depleted stock	Monthly
	Chemical cartridge respirators	Spent chemical adsorbent, seals, depleted stock, torn	Weekly
	Fire extinguishers	Needs recharging	Monthly/after each use
	First aid equipment	Items out of stock or inoperative	Monthly/as used
	Protective clothing	Holes, wear and tear, depleted stock	Monthly/as used
Security Devices	Decontamination facility (showers)	Water pressure, leaking, drainage	Monthly/as used
	Facility gates	Corrosion, damage to chain-link fence or barbed wire, locks broken	Weekly
	Facility fences	Corrosion, damage to chain-link fence or barbed wire fences	Weekly
	Two-way radios/walkie-talkies	Transmitter or receiver damaged	Weekly
	Warning signs	Missing, damaged signs	Weekly
Container Storage Area	Container placement	Wrong storage area, number of containers in each storage area	Weekly
	Sealing of containers	Open lids, damage, bungs missing	Weekly
	Labeling of containers	Improper identification	Weekly
	Containers	Corrosion, leakage, structural defects	Weekly
	Segregation of incompatible wastes	Storage of incompatible wastes in same area	Weekly
	Base or foundation	Cracks, spalling, uneven settlement, erosion, wet spots	Weekly
	Warning signs	Missing, damaged signs	Weekly
	Loading/unloading areas	leakage, spills	Daily/as needed
	Below ground secondary containment tanks	Contains liquids	Weekly

Table F-1 (Continued)

INSPECTION SCHEDULE

<u>Area/Equipment</u>	<u>Specific Item</u>	<u>Type of Problems</u>	<u>Frequency of Inspection</u>
Container Storage Area	Grating over drain pipes	Clogging	Weekly
Stabilization/Fixation Facility	Piping	External Corrosion, Cracks, Distortion	Weekly
	Waste Receipt Area	Waste Processed Area Clean	End of each day/When used
	Grating and Drainage Pipes	Clogging	Weekly
	Sump/Leak Detection System	Presence of Liquid	Weekly
	Floor & Sump Walls	Cracks, Spalling, uneven settlement, erosion	Weekly
	Tanks	Follow Inspection for Tank Storage Area, as applicable	
Tank Storage Area	Level of wastes (sufficient freeboard)	Splashing, overflows	Daily
	Base or foundation	Cracks, Spalling, uneven settlement, erosion, wet spots	Weekly
	Pipe connections	External corrosion, cracks, distortion	Weekly
	Tank shell	Corrosion, discoloration, cracks, buckles, bulges	Weekly
	Protective coating	Corrosion, discoloration, cracks, buckles, bulges	Weekly
	Nozzles and joints	Cracking, corrosion	Weekly
	Tank valves	Cracks, closure, rusting	Weekly
	Load/unloading areas	spills	Daily/when used
	Overflow/overfilling control device		
Tanks	Preliminary visual inspection	Roof	
		Internal supports	Weekly
		Walls	Weekly
		Bottom	Weekly
		Obvious areas of damage	Weekly
	Roof & Structural Members	Thickness	Weekly
		Corrosion, cracking	Weekly
		Seals	Weekly

Table F-1 (Continued)

INSPECTION SCHEDULE

<u>Area/Equipment</u>	<u>Specific Item</u>	<u>Type of Problems</u>	<u>Frequency of Inspection</u>
Tanks (cont'd)	Tank Walls	Cracking, corrosion	Weekly
		Liner crazing	See Section F-2e
		Connection joints & gasket integrity	See Section F-2e
		Bulges, swelling, spalling	Weekly
		Knuckle area integrity	Weekly
		Floor seals	Weekly
		Thickness	Weekly
	Tank Bottom	Corrosion, deterioration (visually & by hammering)	Weekly
		Depressions, uneven settling	Weekly
		Spalling, cracking	Weekly
		Liner crazing	Weekly
		Seals and seams	Weekly
	Fluid Level Detectors	Corrosion, Wear or damage	Weekly
		Operational status	Daily
	Storage and Treatment Tanks Secondary Containment Areas	Check for evidence of spilled materials in particular the catch basins in truck loading/unloading areas	Daily
		Check for cracks, corrosion and gaps in base, dike and sumps	Daily
		Check for evidence of seepage outside containment (e.g., discoloration)	Weekly
		Check for debris, cleanup residue, improperly stored equipment	Daily
	Storage and Treatment Tanks	Inspect tank exterior for cracks, leaks, discoloration, weld defects unsatisfactory condition of rivets and obvious deformation	Daily
		Inspect tank exterior for abrasions, star crazing	Daily

Table F-1 (Continued)

INSPECTION SCHEDULE

<u>Area/Equipment</u>	<u>Specific Item</u>	<u>Type of Problems</u>	<u>Frequency of Inspection</u>
Tank Area (Continued)	Storage and Treatment Tanks	Check high temperature alarm/cut-off system for neutralization tank	Daily
		Check tank wall thickness and integrity; internal inspection for corrosion, peeling, blistering leakage, other visible defects	Annually
	Access Hatches, Vents, and Sampling Ports	Check for leaks	Daily
		Check for blockage	Weekly
		Check for damage	Weekly
	Fill/Drain and Overflow Piping	Inspect piping for leaks	Daily
		Inspect valve seals and gaskets for leaks	Daily
		Inspect pipe insulation or other covering	Daily
		Check that handles are not bent or damaged	Daily
		Check all pipes and valves for corrosion, distortion or deformation	Daily
	Liquid Levels	Check if operator's logbook is up-to-date	Daily
		Check tank liquid level indicators for operability	Daily

Table F-1 (Continued)

INSPECTION SCHEDULE

<u>Area/Equipment</u>	<u>Specific Item</u>	<u>Type of Problems</u>	<u>Frequency of Inspection</u>
Tank Area	Liquid Levels	Check tank liquid level for inadequate freeboard, excessive stresses	Daily
	Safety Vents, Rupture Disks	Check for blockage, tampering rupture or damage	Daily
	Personnel safety items within area	Check eye wash and shower stations	Daily
		Check and maintain clear catwalk and walkways for emergency existing	Daily
		Check condition of tank ladders and catwalk grating	
	Nitrogen Tank Area	Check nitrogen tank pressure indica- tor and integrity	
		Check nitrogen blanket tank manifolds - pressure indicator	
	Leak Detection System	Check LDS in stormwater basin Check LDS under tanks	
Surface Impoundments during construction phase	Construction phase	Observe equipment and execution, check depths width, height, compare to plan specifications	Daily
	Berms and dikes	Height and thickness, compare to plan specifica- tions	Weekly
	Liner End of construction	Shipping damage, off-specification item Cracks, holes, tears, compare to plan specifications	At receipt At completion of construction
	Final cover, sub-base, leak detection system	Lenses, cracks, channels, structural non-uniform- ity, foreign materials, compare to plan specifications	Upon completion
Surface Impoundments, after construction during facility operation	Liquid level	Freeboard level over 2 ft, sudden change in liquid level, freeboard slope	Daily/after storms*
	Vegetation	Erosion, cracking, settling, uplift signs of vegetation damage	Weekly/after storms*
	Discharge hoses and connections	Cracking, fittings for signs of leaks, wet spots, other signs of deterioration	During and after each use

\* Defined as a two-inch rainfall in a 24-hour period as measured on-site.

Table F-1 (Continued)

INSPECTION SCHEDULE

<u>Area/Equipment</u>	<u>Specific Item</u>	<u>Type of Problems</u>	<u>Frequency of Inspection</u>
Surface Impoundments (Continued)	Run-on diversion ditch	Obstruction of flow, bank erosion, ponding vegetation stress	Weekly/after storms*
	Run-off diversion canal and drain	Obstruction to flow, bank erosion, drain clogs, capacity, structural integrity, ponding, vegetation stress	Weekly/after storm*
	Entrance road	Loss of gravel, deterioration of soil, excessive odors	Weekly/after storms*
	Leak detection system (when applicable)	Observation or evidence of liquid, pump operation, component integrity	Weekly/after storms*
	Survey dikes	Movement & settlement of structure	Annually
	Survey dikes	Movement and settlement of structure	
Monitoring Wells	Locks	Tampering, rust	Weekly
Trucks	Tires	Cuts in tread, lower pressure	Weekly
	Brakes	Low brake peddle pressure	As prescribed in maintenance manual/min
	Hydraulics	Leaks in system broken lines	As prescribed in maintenance manual/min
	Trailer Hitches	Broken wires metal fatigue	Each time of use
	Lights - running/emergency	defective bulb, relay, short wiring	Each time of use
	Horns/sirens	defective bulb, relay, short wiring	Each time of use

\*Defined as a two-inch rainfall in a 24-hour period as measured on-site.

it in to the PROTECO facility office each week. A copy of this log is to be kept by the facility for three years.

#### F-2d Inspection Activities for Container Storage Facility

Inspections of the container storage facility will be conducted per the inspection schedule provided in Table F-1. The problems encountered with each specific item (described in Table F-1) shall be noted on the appropriate log sheets. The inspector (i.e., PROTECO chemist or his designated representative) is required to complete both a container storage area inspection log and a tank storage area inspection log every week.

Information provided on the log sheets includes the inspector's name, date and time of inspections, observations made and the date and nature of any repairs or remedial action. A copy of each of these log sheets are provided in Appendix F.1.

The inspector is required to visually check the status of each item and make notations on abnormal conditions. The facility manager will review the inspector's comments, conduct a follow-up inspection of the area noted and determine what maintenance work is needed to correct the problem. This maintenance work needed will be noted on the inspection form and, upon completion of the work, will be noted under the heading of "remedial action taken." At this time, the area noted will receive a follow-up inspection.

Inspectors are also required to observe and note in the container storage area the number of containers, aisle space, inventory quantities and condition of the containers. In the tank storage area, the inspector is required to observe and note the quantity of waste in each tank on a daily basis and the condition of the tank and base on a weekly basis. If the status of a particular item is unacceptable, an appropriate repair schedule shall be implemented or remedial action initiated by the

emergency coordinator to preclude a hazard to either human health or the environment.

F-2e Inspection Activities for Tank Farm and Stabilization/Fixation Facility

Tank inspection program will constitute annual visual inspection of the stainless steel and fiberglass reinforced plastic (FRP) tanks and non-destructive and destructive testings of the carbon steel tanks, as follows: Visual inspection of the tank internal and external surfaces including fittings, will be performed annually. Coupon testing will be performed on the base plate every five years. The inspection log sheets for all the tanks will be interpreted by Registered Professional Engineers.

Where the results warrant it, ultrasonic testing would also be performed. If the tank integrity is determined to be at risk due to excessive corrosion, the tanks would be taken out of service. Depending on the corrosion characteristics and location; i.e. random pitting, localized corrosion, or uniform corrosion, a decision would be made by facility management on whether or not to replace, repair, line the tank. It will only be returned to service if certified by the Professional Engineer as safe for waste storage. All tank entry and inspection procedures are per the American Petroleum Institute (API) "Guide for Inspections of Refinery Equipment" guidelines.

Inspection activities at the Stabilization/Fixation Facility will include inspection of piping, walls, floors, and the drainage sumps weekly, including the leak detection zone in the drainage sump. In addition, the waste receipt area will be inspected daily to assure that all waste has been processed. Inspection activities are shown in Table F-1.

F-2f Inspection Activities for the Surface Impoundments

Surface impoundment inspections are conducted as described in the schedule provided in Table F-1. The inspections are conducted by either

the field supervisor, operation supervisor, the facility chemist or other appropriately trained personnel each week and after every storm of extended duration. The results of the inspection of each impoundment are recorded on separate log sheets entitled "Surface Impoundment Inspection Log Sheet", as depicted in Appendix F.1. In addition, freeboard levels of each impoundment are recorded daily on a log sheet entitled "Daily Freeboard Inspection Log", as depicted in Appendix F.1

Typical problems encountered with each specific item (as noted in Appendix F.1) are recorded on the log sheets. The inspector is required to check the status of each item. Inspectors are required to inspect the entire perimeter of the surface impoundments checking for signs of deterioration and leakage. The facility manager will review the inspector's comments, conduct a follow-up inspection of the area noted and determine what maintenance work is needed to correct the problem.

Prior to the initial use of these surface impoundments, and after any extended period of time during which the impoundment was not in service, PROTECO will obtain certification of the structural integrity of the surface impoundment from a qualified engineer. This certification will establish that the impoundment can withstand the stress of the pressure exerted by the types and amount of wastes to be placed in the impoundment and will not fail due to scouring or piping without dependence on any liner system included in the surface impoundment construction.

#### F-2g Inspection Activities for Landfill Facilities

Inspections of the landfill facilities are conducted as described in the schedule provided in Table F-1. The results of each inspection will be recorded on log sheets entitled "Landfill Inspection Log" as depicted in Appendix F.1. Information on the log sheets includes the inspector's name, date and time of inspection, observations made and the date and number of any repairs made or remedial actions taken. The inspections are conducted every week and after storms of extended duration by either the field supervisor, operations supervisor or the facility chemist, or other appropriately trained personnel.

Typical problems encountered with each specific item (as noted in Table F-1) are to be noted on the log sheets. The inspector is required to check the status of each item. Inspectors are to make observations on the stormwater management systems, leachate and leak detection systems where applicable, entrance roads and liner and capping systems. The inspector will remove the leachate and leak detection system manhole covers and look into the manholes to determine if liquids are present. The facility manager will review the inspector's comments, conduct a follow-up inspection of the area noted and determine what maintenance work is needed to correct the problem.

#### F-2h Inspection Activities During Construction

During construction of the landfills, the quality assurance plans for soil and liner placement (Appendices D-6.3 and D-6.6, respectively) will be followed. These quality assurance plans provide an inspection schedule for each phase of installation, as well as final inspection and certification before the unit is placed in operation.

#### F-2i Inspection of the Groundwater Monitoring Wells

The facility security guards are responsible for in aboveground sections of the monitoring wells and surface area around the wells. The security guards will complete a monitoring well inspection and turn it into the PROTECO facility each week. A copy of the inspection log will be kept by the facility for three years.

*Inspection must be conducted by technical personnel not by security guards!*

During the inspection, the well locks, concrete block, hinged cover and surface area around the well will be inspected for signs of tampering (i.e., well is still in place, no holes, scratches or abrasions), deterioration (erosion of soil away from the well, cracks in concrete, rust on the lock, well casing or hinged door). A copy of the monitoring well inspection log is provided in Appendix F.1.

Typical problems encountered with each specific item (as noted in Table F-1) are to be noted on the log sheets. The inspector is required

to check the status of each item. The facility manager will review the inspector's comments, conduct a follow-up inspection of the area noted and determine what maintenance work is needed to correct the problem.

#### F-2j Remedial Action

If inspections reveal that non-emergency maintenance is needed, it will be completed as soon as possible to preclude further damage and reduce the need for emergency repairs. The inspector will complete a requisition form for the repair(s) and submit it to the General Manager. The General Manager will then initiate the necessary corrective measures. If a hazard is imminent or has already occurred during the course of an inspection or any time between inspections, remedial action will be taken immediately. PROTECO personnel will notify the appropriate authorities (i.e., emergency coordinators) as per the Contingency Plan (see Section G) and remedial actions will be initiated. In the event of an emergency involving the release of hazardous constituents to the environment, efforts will be directed towards containing the hazard, removing it and subsequently decontaminating the affected area.

#### F-2k Inspection Log

The inspection logs that are completed for each of the specific areas or equipment listed in the inspection schedule will be maintained for each calendar year in three-ring binders that are subdivided by sections for each specific operational area. Information contained in the logs include date and time of inspection, name of inspector and a notation of the observations made. If remedial actions are taken, they are also described in the log. A copy of each inspection log sheet used by the facility are provided in Appendix F.1, as discussed. After an inspection, each log sheet is filed in the binder according to area/equipment, which provides a case history on a particular item. The inspection log notebooks are kept with a copy of the inspection schedule in the Lab Manager's office. As required, records of inspections shall be kept for a minimum of three years from the date of inspection.

**F-21 Structural Integrity**

The structural integrity of each unit will be certified before any hazardous waste operations are started at that unit. For the landfills, the structural integrity will be verified following the quality assurance documents for Soil and Membrane Liner Installation (Appendix D-6.6 and D-6.3, respectively).

**F-3 Waiver of Preparedness and Prevention**  
**[40 CFR 270.14(b)(6)]**

PROTECO does not wish to request a waiver of preparedness and prevention requirements under 40 CFR 264 Subpart C.

**F-3a Equipment Requirement**

All fire equipment is maintained and checked in accordance with manufacturer's requirements. When fire equipment is used, it will be sent to the supplier for refilling or replacement. Each on-site vehicle has a five pound dry chemical fire extinguisher, Class A, B and C.

Drawings B511-D-BL20 and B511-D-BL21 shows the location of fire extinguishers in the stabilization facility. Drawing B511-C-FD2 shows the location of fire equipment in the tank farm. Drawing B511-C-FP1 shows the location of fire equipment in the container storage area. It should be noted that the Stabilization/Fixation Facility Tank Farm and Container Storage Facility are served by a fire sprinkler/hydrant system, shown in the drawings. Inspection logs for all of these items can be found in Appendix F.1.

**F-3a(1) Internal Communications.** On-site communications at the PROTECO facility consist of two-way radios which each work team will have. An alarm index to the proposed Tank Farm and Stabilization Area is given in Appendix F.3.

F-3a(2) External Communications. External communications at the PROTECO facility include telephones which will be installed in the laboratory. This phone line will provide a system for summoning emergency assistance from local police departments, fire departments, or Puerto Rico emergency response teams. Each work team on-site will have two-way radios to communicate with the laboratory and relay any emergencies which might require off-site assistance.

F-3a(3) Emergency Equipment. Appendix F.2 lists the locations of the spill control equipment and decontamination equipment which will be available at PROTECO.

F-3a(4) Water for Fire Control. The new facilities at PROTECO include a water main and a 500,000 gallon water tank for storage of water for firefighting. This water tank was sized using calculations given in Appendix F.4 for extinguishing a worst-case fire at the site, a fire in the container storage facility.

Foam fire extinguishing equipment is available off-site at the Fire Department of the Municipality of Ponce. Section G describes the coordination agreement between PROTECO and this fire department.

#### F-3b Aisle Space Requirements

The proposed Container Storage Facility is designed with a main aisle spacing of sixteen feet. Secondary aisle spacing in the Container Storage Facility is five feet between rows of containers. These spacings allow for movement of personnel and equipment between rows of containers and provide access to all containers stored in the facility.

#### F-4 Preventive Procedures, Structures and Equipment [40 CFR 270.14 (b)(8)]

##### F-4a Loading and Unloading Operations [40 CFR 270.14(b)(8)(i)]

F-4a(1) Proposed Container Storage Area. Unloading operations at the future container storage area will involve the transport of wastes in

containers from generators via flat-bed truck. However, the waste containers will be lowered from the truck by either the hydraulic lift or by use of a forklift. The forklift will be used when there are only a few containers holding each specific waste type, otherwise the waste containers will be lowered to the ground using the hydraulic lift. Then, using the fork lift, the waste containers will be placed on (maximum of four containers to a pallet) before they are moved into the appropriate storage section in the future container storage area. The pallets holding the containers will be moved into the storage building using the fork lift.

Several precautions will be taken to reduce the potential for hazards during unloading operations at the future container storage area. First, a concrete ramp will be designed and constructed at the entrance of the future container storage area to facilitate the smooth and accessible movement of the forklift truck in and out of the storage area sections. Second, sixteen feet main aisle spaces will be maintained at all times. Secondary aisle spaces of five feet will also be maintained. These aisles will be kept clean so that no obstructions will be across or in aisles that could create a hazard to human health or the environment. Third, pallets will be used in the transport of containers. Fourth, fire equipment will be located near the unloading areas.

Loading operations at the facility take place in the container storage area. After obtaining a waste movement form (WMF) from the PROTECO lab, wastes stored in the container storage area are transported to the various treatment facilities via front-end loader. During this loading operation a spill of a waste is unlikely due to operator training and proper supervision. However, in the event of an accident the spill or leak from a drum would be contained in the front-end loader bucket. The front-end loader would be moved to the appropriate treatment area where the spilled waste and any cleanup materials generated from the spill would be added to one of the treatment processes and treated/disposed of as a hazardous waste. The front-end loader and any other equipment used will be decontaminated before loading operations are continued.

Ramps are provided at the entrance of all treatment areas to facilitate access of the front-end loader in and out of the treatment areas. Once the front-end loader arrives at the appropriate treatment area, the bucket is lowered and the containers are carefully removed by the PROTECO operating personnel.

F-4a(2) Proposed Decant Facility. Prior to the transfer of any wastes at the Decant Facility, Storage Bay 18 in the Container Storage Facility, the waste will be analyzed as per Section C-3, the Waste Analysis Plan, to ensure compatibility with any other containers temporarily transferred to Bay 18. A maximum of two 55-gallon containers, or an equivalent volume, will be transferred to this facility at one time to allow sufficient mobility of employees and equipment in the area. The unloading or decanting of these containers will take place through waste class specific piping. The decanting pump will be decontaminated between pumping of incompatible waste classes. A further description of the loading and unloading practices followed in this unit is given in Section D-3.

F-4a(3) Proposed Tank Farm. The Tank Storage and Treatment Facility design incorporates several features to prevent uncontrolled release of hazard waste during the loading and unloading of tanks. These features are:

- Truck unloading takes place on an epoxy coated concrete pad surrounded by a curb and sloped to a catch basin.
- For major spills, the truck unloading catch basin is gravity drained to the Stormwater Retention Surface Impoundment.
- Secondary containment is provided around the base of each tank.
- Locked filler caps on the tanks prevent overfilling since the filling process involves inventory reconciliation by operations personnel before any unloading into a tank can take place.

- Automatic level indicators and high level alarms prevent overfilling.

F-4b Run-off [40 CFR 270.14(b)(8)(ii)]

F-4b(1) Proposed Container Storage Area and Stabilization/Fixation Facility. The proposed container storage facility will consist of an impervious concrete base at least six inches thick. The base will have a one percent slope towards separate floor drains and sumps in 16 separate storage bays. The proposed container storage bays within the building will be separated by concrete walls which surround each section and prevent runoff from leaks or spills. All liquids which reach the base will flow to the respective

The entire container storage area as well as the Stabilization/Fixation Facility will be covered by a building. The building will divert any direct rainfall and therefore prevent precipitation from contacting the drums in the storage area. Because no precipitation can come into contact with the waste, no runoff of hazardous waste located within the building will occur.

F-4b(2) Proposed Decant Facility. The run-on/run-off prevention features for the decant facility are the same design as the Container Storage Facility since the Decant Unit is housed in the container storage building.

F-4b(3) Proposed Tank Farm. Run-on is prevented in the Tank Farm by six inch curbing around each tank. This curb also prevents run-off from being discharged from the tank area. Instead, any run-off is transferred to the Stormwater Retention Surface Impoundment.

F-4b(4) Proposed Surface Impoundments. The main run-off prevention feature for the proposed surface impoundments is the design of these impoundments to allow for 2 feet of freeboard.

F-4c Water Supply [40 CFR 270.14(b)(8)(iii)]

The major feature at PROTECO to prevent contamination of water supplies is the Surfacewater Management Program which has been developed and is described in Section D.6. This plan prevents runoff from coming in contact with hazardous waste on-site.

Also, the PROTECO Inspection Plan Section F.1, aids in the prevention of equipment failure. The Contingency Plan, described in Section G, provides immediate responses to any leaks or spills which might occur.

F-4d Equipment and Power Failure [40 CFR 270.14(b)(8)(iv)]

The PROTECO facility will have a back-up generator to compensate for any power failures which may occur at the site. This 480 volt, three phase power emergency generator will be connected to the following emergency systems:

- Fire Pump
- Key lighting throughout the site
- Level alarm systems for all on-site tanks.

In the case of a power failure, all unnecessary hazardous waste operations will be halted. Start-up of these operations will occur only by order of the site general manager.

Most of the equipment used in the tank farm, stabilization/fixation facility and the container decant facility has been designed to "fail safely." This means that the failure of each piece would result in a nonhazardous situation.

The only process which was not designed to "fail safely" is the the regulating check valve in the unloading line used during a tank emptying into a tanker truck. In the event of this valve failure, there is a back-up, manually-operated valve from which flow to the tanker truck can be shut-off. Also, the tanker truck will be loaded on the diked truck loading/unloading area where any spills resulting from the equipment failure can be contained.

(0119C)

**F-4e Personnel Protection [40 CFR 270.14(b)(8)(v)]**

PROTECO takes several measures to prevent undue exposure of facility personnel to hazardous waste. First, PROTECO will obtain chemical fact sheets on any of the hazardous wastes treated, stored or disposed of at the facility. These fact sheets provide information on the health hazards, toxicology, fire and explosion hazards, containment and cleanup procedures for fires or spills and first aid. These sheets are reviewed with operating personnel during initial and annual personnel training classes held by PROTECO.

All personnel are required to wear hard hats, safety shoes (boots) and glasses while on active portions of the site. The type and quantity of available protective equipment to be used in case of a spill, leaking drum or an emergency situation is listed in detail under the Contingency Plan (see Section G). Use of personnel protective equipment is covered in initial and annual personnel training (Section H).

**F-5 Prevention of Reaction of Ignitable, Reactive and Incompatible Waste [40 CFR 270.14(b)(9)]**

A number of waste handling procedures are utilized by PROTECO to preclude the occurrence of a hazardous reactions occurring at the facility that could cause harm to human health or the environment. The reactions that must be prevented included the following:

- generation of extreme heat, pressure, fire, explosion or violent reactions
- production of uncontrolled flammable fumes, dusts or gases in significant quantities to threaten human health or the environment
- production of uncontrolled flammable fumes or vapors in sufficient quantities to pose risk of fire or explosion
- damage to structural integrity of the containment devices or the facility

**F-5a Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Wastes**

PROTECO does not accept reactive wastes for treatment, storage or disposal at the facility. As a preventive measure, all wastes that might exhibit the potential for reactivity will be analyzed by the PROTECO laboratory before acceptance of a waste movement to determine if the waste is reactive (see Section C). If the wastes are reactive, PROTECO does not accept the waste movement. The movement is returned to the generator and thereby, the potential of a reactive waste causing an explosion or unanticipated reaction at the facility is eliminated.

Ignitable wastes are accepted by PROTECO for treatment, storage or disposal. These wastes are stored in containers in the Container Storage Facility while awaiting treatment. Ignitable wastes are also stored in the Halogenated and Non-Halogenated Solvent Tanks at the facility. Ignitable wastes are treated and disposed of by PROTECO in the Stabilization/Fixation facility, or by off-site shipment for burning or incineration. Ignitable wastes to be stabilized/fixed are subject to testing to assure the process can be conducted safely (as per Section C).

No sources of ignition such as open flames or sparking equipment are allowed in the vicinity where ignitable wastes are handled. Additionally, electrical wiring and appurtanences in the following areas are designed for explosion-proof service (per the applicable National Electric Code):

Container Storage Facility  
Tank Farm Storage/Treatment Facilities  
Stabilization/Fixation Facility

Signs with the legend "No Smoking" are posted in the container storage area, entrance to the landfill, tank farm, stabilization/fixation facility and at the drum decant unit to prevent any employee, contractor or visitor from smoking or striking matches in an area where ignitable wastes are handled. The procedures used in managing containers holding ignitable wastes and the handling procedures used at the facility are discussed in the following sections.

The only area where the potential for spontaneous ignition exists at the PROTECO facility is in the headspaces of the Oil and Non-Halogenated Solvents Storage Tanks. For this reason, a nitrogen blanket is kept on these tanks thereby preventing any ignitable gas build-up in the headspace of these tanks. This nitrogen blanket is attached to a pressure alarm and, should a leak develop or the nitrogen blanket fail, the alarm will sound to alert personnel. If necessary, the Contingency Plan, described in Section G, can be implemented at this time.

F-5b General Precautions for Handling Ignitable Wastes or Accidentally Mixing Incompatible Wastes

Precautions taken by PROTECO to handle ignitable wastes in a safe manner (to prevent accidental release, fire, or explosion) include employee training and supervision, weekly facility inspections, grounding of containers, elimination of ignition sources and container segregation techniques.

PROTECO assures waste to container compatibility by providing generators with container compatibility information during the generator audit and reviewing container storage methods during the waste preacceptance review phase (see Section C-5). Second, when containers are received in a waste movement, they are inspected by the facility chemist or other appropriately trained personnel to determine that there are no signs of leaks, spills or container deterioration.

Containers are kept closed while in the storage area unless opened for sampling or waste transfer. Prior to opening a metal container holding ignitable wastes to take samples, operating personnel will ground the container. In addition, only non-sparking tools (brass hammers, wrenches, etc.) are used to open or close these containers.

PROTECO takes precautions to ensure that all ignition sources (e.g., open flames, sparks) are eliminated from all ignitable waste treatment areas and the container storage area. Warning signs with the legend "No Smoking" are posted in all areas where ignitable wastes may be present to warn any contractors and visitors of the hazards in the area.

Also, all piping for decant and tank farm operation is separate for each waste class, such that mixing cannot occur due to misvalving. All waste classes are color coded in identification as:

Tanks  
Piping  
Containers in Storage  
Waste Movement Forms

Finally, parts for discharge of liquids are also color coded and locked per individual keys as described in Section C.

Incompatible wastes are strictly segregated in the drum storage area using the methods described in Section C, the Waste Analysis Plan, and Section D. Incompatible wastes are not mixed with other wastes by PROTECO. If incompatible wastes are accidentally mixed or if incompatible wastes are accidentally mixed with other materials, the Contingency Plan will be implemented as described in Section G. This plan includes precautions after this accident to prevent reactions which:

- generate extreme heat or pressure, fire or explosions, or violent reactions,
- produce uncontrolled flammable fumes, dusts or gases in sufficient quantities to threaten human health or the environment,
- produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions,
- damage the structural integrity of the device or facility, and
- by similar means threaten human health or the environment.

**F-5c Management of Ignitable Wastes in Containers**

Precautions taken in the drum storage area to prevent accidental fire or explosion include proper storage of containers (e.g., stacking, aisle space, labeling and sealing of containers), dikes and appropriate warning signs.

Prior to accepting containers holding hazardous waste for treatment, storage or disposal PROTECO assures that the container is sealed, marked and labeled as required under 40 CFR 262. The labels are checked because they identify the point of generation, the contents of the container, the EPA code number, the date the wastes were generated and any dangers the waste could exhibit.

PROTECO stores ignitable wastes in the drum storage area in accordance with Occupational Safety and Health Administration (OSHA) regulations and NFPA Code. The proposed container storage area was designed to meet NFPA codes. Signs with the legend "No Smoking" are posted at the entrance of the drum storage area and sources of ignition, such as open flames or sparks, are not allowed in these areas.

Containers are stored on pallets to minimize contact with precipitation, leaks or spills, and ignitable wastes are never stacked more than one container high. A minimum of 5 feet is maintained in the aisles and a minimum of 4 feet will be maintained in the proposed exiting area to allow access of personnel, handling equipment and emergency equipment. The proposed area will be located at least 50 feet as is required by the NFPA code and which meets the requirements of the RCRA regulations. The containers are stored in such a way so as to permit approach of fire control apparatus under all weather conditions (less than 200 feet from the access road) as required by NFPA.

**F-5d Management of Incompatible Wastes in Containers**

As described above, prior to accepting containers holding hazardous wastes for treatment, storage or disposal, PROTECO assures that the

container is sealed, labeled and marked. Wastes stored in the existing container storage area are segregated into separate storage bays.

Containers are inspected when they are received at the facility for signs of leaks or spills, container deterioration or pressurization. Should a waste need to be transferred from a container due to deterioration or leakage, PROTECO will use a container that is compatible with the waste. The containers are kept closed at all times and are opened on for sampling or decanting.

Incompatible wastes are strictly segregated in the container storage facility bays and are never mixed, treated or disposed of together by any PROTECO operating personnel. Decanting operations take place by waste class only.

PROTECO has established a color coding system to assure that incompatible wastes are not placed in the same containers. This system, which includes laboratory verification of the compatibility prior to any waste mixing, is described in Section C, the Waste Analyses Plan.

To prevent any incompatible wastes and materials from being placed in an unwashed container that previously held incompatible wastes, there is no reuse of empty containers at the PROTECO facility.

#### F-5e Management of Ignitable or Reactive Wastes in Tanks

No reactive wastes will be stored in tanks at the PROTECO facility.

Fire protection is provided by dry chemical fire extinguishers and fire hose stations at each truck unloading/loading area. In addition, all piping potentially carrying flammable liquids are grounded, including provisions for tanker truck unloading/loading station ground jumpers, per Section 6010 of the technical specification.

The tank farm is classified as a Class 1, Division 1, Group C fire hazard area per the National Electric Code (NEC). All electrical

equipment and fixtures will be explosion-proof, and the oil and oil sludge tanks and solvents tanks have flame arrestors on their conservation and pressure relief valves, respectively. The solvents tanks are also blanketed by nitrogen, from a compressed nitrogen tank T-16 with manifold at each tank, to prevent air entry into the vapor spaces, creating a combustible atmosphere.

Equipment safety devices include pressure relief valving across the positive displacement pumps which continue to create pressure on "deadheading" and on the nitrogen-blanketed solvents tank. Further, the manways on the solvents and oils and oil sludge tanks are designed as explosive relief vents.

#### F-5f Management of Incompatible Wastes in Tanks

No incompatible wastes or materials are placed in tanks at PROTECO. The mixing of incompatible wastes in tanks is prevented by the waste acceptance procedures for tanks, described in Section C-8 of this application and outlined in Figure C-12. These procedures require a double-check and approval from the laboratory prior to any additions to a tank. If this approval is given, the operator receives the laboratory's key to the locked color-coded cap for the approved tank.

Also, each tank is surrounded by a separate concrete berm secondary containment system. Each secondary containment can hold the entire contents of the tank, thereby preventing mixing of incompatible wastes from any spills, leaks or ruptures at the tank facility.

#### F-5g Management of Ignitable Wastes Placed in Surface Impoundments

No ignitable wstes will be placed in the Surface Impoundments at PROTECO. The surface impoundments are for storage of leachate from the landfill and stormwater.

#### F-5h Management of Incompatible Wastes Placed in Surface Impoundments

No incompatible wastes will be placed in the surface impoundments.

F-5i Management of Ignitable Wastes Placed in Landfills

Ignitable wastes are not accepted for direct landfill disposal at PROTECO. Any ignitable waste (as classified upon receipt) will first be rendered non-ignitable before placement in a landfill at PROTECO. The Waste Analysis Plan, as described in Section C, outlines the procedures for managing ignitable wastes at PROTECO which prevent ignitable wastes being placed in a landfill.

F-5j Management of Incompatible Wastes Placed in Landfills

No incompatible wastes will be placed within the same cell of a landfill at PROTECO. The waste analysis, Section C, describes the waste management procedure which prevents this occurrence.

**APPENDIX F-1**

**FACILITY INSPECTION SHEETS**

FIGURE 1

PROTECCION TECNICA ECOLOGICA, INC.  
SAFETY AND EMERGENCY EQUIPMENT INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Absorbents</u>			
Note amount on hand			
<u>Absorbent Booms/Pads</u>			
Note amount on hand			
<u>Containment Drums</u>			
Note amount on hand			
<u>Eyewash Stations</u>			
Check for water pressure, leaking, drainage			
<u>Face Shields/Goggles</u>			
Check for broken, dirty, amount on hand			

FIGURE 1 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
SAFETY AND EMERGENCY EQUIPMENT INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Cartridge Respirator</u>  Check for broken, dirty, replace parts, spent chemical absorbent			
<u>Fire Extinguishers</u>  Check by NFPA Standards			
<u>First-Aid Equipment</u>  Check for items out of stock or inoperative			
<u>Protective Clothing</u>  Check for holes, tears, dirty, check stock			
<u>Showers</u>  Check for water pressure, leaking, drainage			

FIGURE 2

PROTECCION TECNICA ECOLOGICA, INC.  
SECURITY DEVICES INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Chain-Link Fence</u>  Inspect for corrosion, damage to chain-links or strands of barbed wire			
<u>Barbed Wire Fence</u>  Inspect for corrosion, damage to barbed wire or wooden posts, fence still in place			
<u>Warning Signs</u>  Inspect for corrosion, signs still in place, legibility			
<u>Gates</u>  Inspect for corrosion, damage to chain-links or barbed wire strands; corrosion to lock, sticking			

FIGURE 2 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
SECURITY DEVICES INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Walkie-talkies and Radio- telephone</u>			
Inspect to determine if equipment can transmit and receive			

FIGURE 4

PROTECCION TECNICA ECOLOGICA, INC.  
CONTAINER STORAGE AREA INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Container Placement</u>			
Inspect for wrong storage area, incompatible wastes, number of containers in each area			
<u>Container Seals</u>			
Inspect for open lids, bungs missing, damage to lids			
<u>Container Marking</u>			
Inspect for improper labels, labels or markings faded, labels damaged or missing			
<u>Containers</u>			
Inspection of containers for leaks, deterioration, pressurization, structural defects			

FIGURE 4 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
CONTAINER STORAGE AREA INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Base/Foundation</u>			
Inspect for cracks, spalling, erosion, wet spots, settlement			
<u>Warning Signs</u>			
Inspect for signs missing or damaged			
<u>Base/Foundation</u>			
Inspect for cracks, spalling, erosion, set spots, settlement			
<u>Tank Shell and Bottom</u>			
Inspect for corrosion, wet spots, cracks, buckles, bulges, discoloration			

FIGURE 4 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
CONTAINER STORAGE AREA INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Tank Valves, Nozzle, Joints</u>			
Inspect for cracks, corrosion closure			
<u>External Supports</u>			
Inspect for cracking, corrosion			
<u>Ground Surface</u>			
Inspect for cracks, deterioration, wet spots			
<u>Pipe Connections</u>			
Inspect for external corrosion, cracks, distortion			

FIGURE 6

PROTECCION TECNICA ECOLOGICA, INC.  
SURFACE IMPOUNDMENT INSPECTION LOG

Inspector's Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Name of Impoundment: \_\_\_\_\_

Item to be Inspected	Status Acceptable/Unacceptable	Observations Made	Remedial Actions/ Taken and Date
<u>Liquid Level</u>			
Check freeboard, free-board slope, changes in liquid level, give date and status			
<u>Dikes/Berms</u>			
Check for structural integrity, erosion, cracking, leaks, wet spots			
<u>Vegetation</u>			
Erosion, deterioration wet spots, signs of vegetation damage			

FIGURE 6 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
SURFACE IMPOUNDMENT INSPECTION LOG

Inspector's Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Name of Impoundment: \_\_\_\_\_

Item to be Inspected	Status Acceptable/Unacceptable	Observations Made	Remedial Actions/ Taken and Date
<u>Discharge Hoses/Connections</u>			
Check connections, crack- ing in hose, signs of leaks, other signs of deterioration			
<u>Run-on Diversion Ditch</u>			
Obstruction of flow, bank erosion, ponding, vegeta- tive stress			
<u>Runoff Diversion Drain</u>			
Obstruction of flow, bank erosion, ponding, vegeta- tive stress			

FIGURE 6 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
SURFACE IMPOUNDMENT INSPECTION LOG

Inspector's Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Name of Impoundment: \_\_\_\_\_

Item to be Inspected	Status Acceptable/Unacceptable	Observations Made	Remedial Actions/ Taken and Date
<u>Entrance Road</u>			
Loss of gravel, deterioration of soil, excessive odors			
<u>Leak Detection System</u>			
Observation or evidence of liquid, pump operation, component integrity			

FIGURE 7

PROTECCION TECNICA ECOLOGICA, INC.  
LANDFILL FACILITY INSPECTION LOG

Inspector's Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Name of Impoundment: \_\_\_\_\_

Item to be Inspected	Status Acceptable/Unacceptable	Observations Made	Remedial Actions/ Taken and Date
<u>Dikes/Berms</u>			
Check for structural integrity, erosion, cracking, leaks, wet spots			
<u>Vegetation</u>			
Erosion, deterioration wet spots, signs of vegetation damage			
<u>Discharge Hoses/Connections</u>			
Check connections, cracking in hose, signs of leaks, other signs of deterioration			

FIGURE 7 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
LANDFILL FACILITY INSPECTION LOG

Inspector's Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Name of Impoundment: \_\_\_\_\_

Item to be Inspected	Status Acceptable/Unacceptable	Observations Made	Remedial Actions/ Taken and Date
<u>Run-on Diversion Ditch</u>			
Obstruction of flow, bank erosion, ponding, vegetative stress			
<u>Runoff Diversion Drain</u>			
Obstruction of flow, bank erosion, ponding, vegetative stress			
<u>Entrance Road</u>			
Loss of gravel, deterioration of soil, excessive odors			
<u>Leak Detection System</u>			
Observation or evidence of liquid, pump operation, component integrity			

FIGURE F-10

PROTECCION TECNICA  
ECOLOGICA  
STABILIZATION/FIXATION FACILITY

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<ul style="list-style-type: none"><li>° End of each day - all waste processed</li><li>° Check sediment and sump pits</li><li>° Check operation of gas detection system</li><li>° Check operation of feed systems</li><li>° Check operation of conveyer &amp; pug mill</li><li>° Check integrity of floors, floor ramps, curbs</li><li>° Check operation of lime system</li><li>° Check dust collectors - all equipment</li><li>° Check piping and valving</li><li>° Check locks on filler caps</li><li>° Check key overrides</li><li>° Check interlock and alarm system</li><li>° Check batch tank leak containment system</li></ul>			

FIGURE F-10 (CONTINUED)

PROTECCION TECNICA ECOLOGICA, INC.  
SURFACE IMPOUNDMENTS AREA INSPECTION LOG

Items to be Inspected	Date and Time	Name of Inspector	Observations and Remedial Action Taken
<u>Leak Detection System</u>			
° Check LDS			
° Check freeboard			
° Check pump operation			
° Check valves			
° Inspect liner			
° Inspect surrounding ground surface			
° Check grit chamber			

APPENDIX F.2  
Spill Control Equipment Locations

This information is contained in Appendix G.4.

APPENDIX F.3

APPENDIX F.4

BY \_\_\_\_\_ DATE \_\_\_\_\_

FRED C. HART ASSOCIATES, INC.

SHEET

OF

PAGE

CHK'D \_\_\_\_\_ DATE \_\_\_\_\_

SUBJECT Fire Protection for Drum Storage JOB NO. \_\_\_\_\_  
Flammable Liquid Class I-A  
Palletized or Solid Stacked 1-High (S'max)

Sprinkler Density

0.60 GPM/⌘

Area (286° F)

5000 ⌘

Hose Stream

750 GPM

Duration of Water Supply

120 min

Max. Head Space

80 ⌘

Min Head Flow

48 GPM

Starting Head Pressure

(k = 8 1/2 1 7/32 ⌘)

36 PSI

Sprinkler System Demand

$$5000 \text{ ⌘} \times 0.60 \frac{\text{GPM}}{\text{⌘}} = 3000 \text{ GPM}$$

Allowance for Friction  
& Elev Head Loss

+ 1.10

3000 GPM

Hose Stream

750 GPM

4,050 GPM

Duration

120 min

486,000 Gallons

Requires 3000 GPM fire pump  
125 psi(cost ≈ \$35,000  
not including Pump house)

Water Storage

500,000 Gallon tank  
(fabritan ≈ \$108,000  
installed)

(steel tank ≈ \$280,000)

Sprinkle System

cost ≈ \$15,000

TOTAL ESTIMATED COST (MIN)

(does not include = \$158,000

V/6 &amp; Hydrants, etc)

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## SECTION G

CONTINGENCY PLAN

The Proteccion Tecnica Ecologica, Incorporated (PROTECO) hazardous waste contingency plan is designed to minimize hazards to human health and the environment from fires, explosions or any unplanned releases of hazardous waste into the air, soil or surface water. The plan maps out the general strategies for dealing with both sudden (acute) and non-sudden events. The strategies involve a series of steps to be taken in response to an actual emergency incident and includes decision points where outside assistance may be required and the circumstances under which the evacuation of the facility is advisable. The strategies also identify the equipment and materials that are to be used if an incident should occur.

The facility emergency coordinator is the person designated by the facility to be responsible for coordinating response and recovery activities at the facility during emergencies. The actions that will be taken by the coordinator following the discovery of an emergency are incorporated into the plan.

Although the contingency plan provides a plan of action to be taken during and after an emergency situation has occurred, training of personnel is necessary to ensure that the correct actions are taken before, during and after the emergency. The training of personnel includes procedures relevant to the positions in which individuals are employed so that they are able to respond to emergencies and are familiar with emergency procedures, emergency equipment and emergency systems.

The hazardous waste contingency plan contains eight parts:

1. General Information: Provides pertinent information concerning Proteccion Tecnica Ecologica, Inc.

2. **Emergency Coordinators:** Includes the names, addresses and phone numbers of all personnel qualified to act as emergency coordinators during an incident at the facility.
3. **Implementation of the Contingency Plan:** Provides guidance to the emergency coordinator in making decisions on when to implement the contingency plan.
4. **Emergency Response Procedures:** Includes the actions to be taken when it becomes necessary to implement the contingency plan and the procedures for removing a surface impoundment from service.
5. **Emergency Equipment:** Includes lists of all emergency equipment located at the facility that can be used in the implementation of the contingency plan.
6. **Coordination Agreements:** Describes the emergency arrangements agreed to by the local police and fire departments.
7. **Evacuation Plan:** Describes evacuation of the facility should it be necessary to consider evacuation.
8. **Required Reports:** Lists the reports that must be completed after an incident requires the implementation of the contingency plan.

The information as contained herein is submitted in accordance with 40 CFR 270.14(b)(7), 270.14(c)(3)(vi) and 264 Subpart D and the Puerto Rico Environmental Quality Board (EQB), Part VIII, Rule 810 and 811 and Part IX, Rule 902(d).

G-1 General Information [40 CFR 270.17(f)]

PROTECO operates the 35-acre treatment storage and disposal facility located 7 KM southeast of the City of Penuelas, Puerto Rico. PROTECO's EPA identification number is PRD091018622. The primary Emergency Coordinator (EC) of the facility is listed in Appendix G.1. He can be reached



at (809) 836-2058 between 8 a.m. and 5 p.m. on weekdays. The facility chemist, also listed in Appendix G.1, is the alternate emergency coordinator and can also be reached at (809) 836-2058 between 8 a.m. and 5 p.m. on weekdays. A summary of the general information is provided in tabular form in Table G-1 for ease of use during an emergency situation.

The activities conducted at the PROTECO hazardous waste management facility include the treatment, storage and disposal of hazardous waste and the treatment and disposal of non-hazardous waste. The hazardous wastes received and accepted at the facility are generated from many diverse manufacturing and government operations located in the Commonwealth of Puerto Rico. The hazardous waste is transported from these generators to the facility primarily by the PROTECO transportation staff. The plant address is:

Proteccion Tecnica Ecologica, Inc.  
Road 385-Km. 3.5  
Tallaboa,  
Penuelas, Puerto Rico  
(809) 836-205

The mailing address is:

Proteccion Tecnica Ecologica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Two methods are currently used to treat the hazardous wastes accepted for treatment, storage and disposal to render the wastes less hazardous, non-hazardous, stabilized and/or more amenable to disposal. The primary method used is stabilization/fixation. This treatment procedure renders a waste to a concrete-like solid material by reacting cement kiln dust, water and waste to form a solid. PROTECO also employs neutralization as a

TABLE G-1

GENERAL INFORMATION SUMMARY

Name of Facility:	Proteccion Tecnica Ecologica, Inc.
EPA I.D. Number.:	PRD091018622
Location:	Road 385 - Km 3.5 Tallaboa Penuelas, Puerto Rico
Mailing Address:	Firm Delivery Ponce, Puerto Rico 00731
Facility Telephone Number:	(809) 836-2058
Facility Owner:	Compania Ganadera del Sur, Inc.
President:	Jorge Fernandez
Type of Facility:	Hazardous waste treatment, storage and disposal facility
Facility Site Plan:	Figure G-1
Description of On-Site Activities:	Stabilization/Fixation Neutralization Storage of waste in Containers Storage of waste in Tanks Storage of wastes in Surface Impoundments Landfill

treatment process. Acidic and alkaline wastes are combined in this process resulting in a waste with an acceptable pH level (6.0 to 9.0).

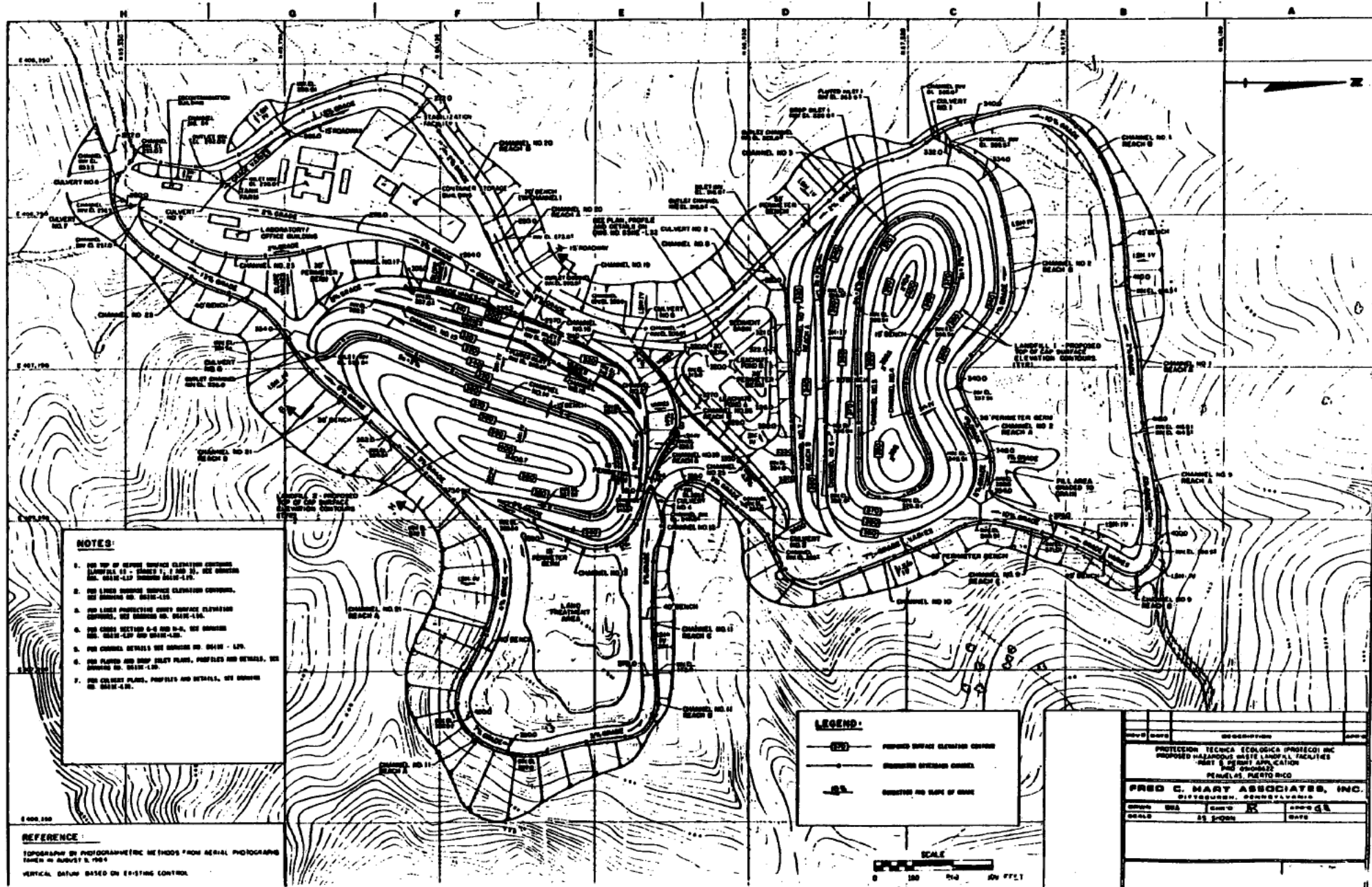
Figure G-1 locates the proposed treatment, storage and disposal sites at the PROTECO facility. A new tank farm consisting of eight (8) above-ground treatment/storage tanks will be constructed to improve PROTECO storage and waste handling capabilities. A new Stabilization/Fixation Facility will include a pug mill, batch tanks and three silos containing lime, kiln dust and fly ash.

Table G-2 summarizes proposed disposal practices at PROTECO.

The facility accepts a broad range of hazardous wastes. Primarily, the wastes are received in liquid form. PROTECO also treats, stores and disposes of those wastes that are solid, sludges or slurries. Both characteristic and listed wastes as defined by 40 CFR 261 are accepted for treatment storage and disposal and include but are not limited to:

- ignitable wastes
- corrosive wastes
- EP toxic wastes
- halogenated solvents
- pesticide waste
- electroplating sludges

In addition to the proposed hazardous waste facilities described above, the PROTECO hazardous waste management facility also consists of non-hazardous waste treatment and disposal facilities.



**FIGURE G-1**  
**PROPOSED PROTECO FACILITIES**

TABLE G-2

SUMMARY OF PROPOSED TREATMENT,  
STORAGE DISPOSAL PRACTICES AT PROTECO

STORAGE FACILITIES

Container Storage Facility

Surface Impoundments

Tanks

T-1 Alkali Tank

T-2 Acid Tank

T-4 Halogenated Solvents Tank

T-5 Non-Halogenated Solvents Tank

T-6 Oil Sludge Tank

T-7 Aqueous Tank

T-8 Oils Tank

TREATMENT FACILITIES

Tank

T-3 Neutralization Tank

Stabilization/Fixation Unit

DISPOSAL FACILITIES

Landfill I

Landfill II

## G-2 Emergency Coordinators [40 CFR 264.52(d) and 264.55]

The PROTECO emergency coordinator is the person designated by the facility to be responsible for coordinating the response, control, cleanup and recovery activities at the facility during an emergency situation. He is responsible for the coordination of facility emergency personnel and for contacting outside emergency assistance. He decides how much personnel is needed, what equipment to use and what strategies to employ to achieve a safe, efficient and effective containment and cleanup. He keeps in contact with the facility general manager during an emergency situation to coordinate the need for additional outside help, replacement men and/or supplies. The coordinator is designated authority by PROTECO to commit the resources needed to carry out the contingency plan (money, manpower, equipment, etc.). This authorization is shown in Figure G-2.

The emergency coordinator and his alternates are expected to be thoroughly familiar with all aspects of the PROTECO contingency plan, the facility layout, the characteristics of the wastes that are handled by the facility, the treatment, storage and disposal operations, and the location of all records kept by the facility. The emergency coordinator and alternates receive specialized training to ensure that they are familiar with the above. The emergency coordinator's job responsibilities as defined in 40 CFR Section 265.55 and 264.56 are provided in Appendix G.2.

At all times, there is at least one emergency coordinator either on the facility premises, at the Penuelas office or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time). Appendix G.1 lists the primary and alternate PROTECO emergency coordinators.

## G-3 Implementation of the Contingency Plan [40 CFR 264.51]

In the event of fire, explosion, or accidental materials release, response activities are initiated, as appropriate, following evaluation of the event by the Facility's Emergency Coordinator (EC). Response activities are directed as appropriated, and a decision is made whether or not to implement the Full-Scale Contingency Plan.



## FIGURE G-2

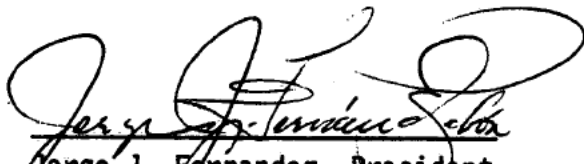
## EMERGENCY COORDINATOR AUTHORIZATION LETTER

I, Jorge J. Fernandez, the duly qualified and President of Proteccion Tecnica Ecologica, Inc., a Puerto Rico Corporation, hereby certify the following:

That the Corporation hereby grants to the individual(s) designated as "Emergency Coordinator" in the approved Contingency Plan for the Proteccion Tecnica Ecologica facility to commit such of the Corporation's resources as are needed to carry out such Contingency Plan; and

Be it further Resolved: That the individual(s) designated as "Emergency Coordinator" in such approved Contingency Plan be and hereby are authorized, directed and empowered to execute and deliver for and on behalf of the Corporation any and all such contracts, agreement, documents and memoranda to be necessary and appropriate to execute the herein authorized resolution.

Dated: June 25, 1986

  
Jorge J. Fernandez, President



**G-3a Emergency Alert--Incident Assessment and Decision Process**

A logic diagram of initial response activities leading to implementation of the Contingency Plan is shown in Appendix G.2A. Should a fire, explosion, or spill be of a minor controllable nature and present no potential hazard to human health or the environment, the Emergency Coordinator (EC) will only implement the emergency alert procedures in this section, post-emergency procedures described in Section G-4f, and complete the necessary reporting, which is described in Section G-8.

In case of an imminent or actual emergency situation, the person observing the incident will:

- Activate the emergency alert (one rise of the siren to maximum pitch) to notify Facility personnel if a site-wide alert is needed.
- Utilize a two-way radio system (or go in-person) to notify the Facility EC, or an assigned surrogate, of the location, nature, and extent of the incident.

Subsequently, the EC will set up a command post and take control of the affected area, including the commitment of any resources until the emergency has been eliminated, and warranted cleanup or restoration is completed. The EC will direct the following activities:

- Where applicable, confirm that appropriate operations are stopped and that any released waste is contained and collected to ensure that fires or explosions do not spread.
- Determine the source, extent of the spill materials, and assess the potential for primary and secondary hazards. Evaluation criteria used by the EC to determine the Full-Scale Contingency Plan should be implemented are presented in Table G-2A.

TABLE G-2A

EVALUATION CRITERIA FOR  
IMPLEMENTATION OF CONTINGENCY PLAN PROCEDURES

Fire and/or Explosion

- Fire could cause the release of toxic fumes
- The fire could spread, thereby possibly igniting materials in other locations (on-site), or could cause heat-induced leaks or explosions
- The use of fire suppressants could result in contaminated runoff
- Explosion could:
  - result in danger from flying fragments or shock waves
  - ignite other hazardous wastes at the Facility
  - release toxic materials
- Fire could endanger human health for any other reason

Spills or Material Release

- A spill could release toxic or flammable liquids or vapors, thus causing a fire or gas explosion hazard
- The spill could result in off-site soil contamination, or significant on-site soil contamination
- A spill could endanger human health or the environment for any other reason.

- Insure that any materials spilled in the incident area are isolated from incompatible materials/wastes
- Activate and direct the Contingency Plan activities pursuant to procedures in Section G-3b, as necessary

G-3b Full-Scale Contingency Plan

When a decision has been made to implement the Full-Scale Contingency Plan, the EC will direct:

- Initiation of containment and control procedures, as described in Section G-4,
- An accounting of all Facility personnel/visitors by head count and review of the Facility's sign-in/sign-out register
- Implementation of internal notifications
- Notification of authorities and requests for assistance, as necessary
- Coordination of first-aid activities, if casualties are involved
- Activation of the Evacuation Plan described in Section G-7, if required

G-4 Emergency Response Procedures[40 CFR 264.52(a), 264.56, 264.194(c) and 264.227(c)]G-4a Notification

In the event of the discovery of an imminent or an actual emergency situation the employee or security guard discovering the situation must immediately contact the Emergency Coordinator (EC) or his alternate. Upon notification, the emergency coordinator will obtain as much of the following information as possible: brief description of the incident, exact location, time, accessibility and hazardous waste(s) involved.

After assessing the situation, the emergency coordinator will provide instructions to operating personnel exposed to the danger and to the security guards so they can take the appropriate actions. Each work team at the facility will carry a two-way radio to allow communications with the laboratory.

In the event of a sudden (acute) emergency, the emergency coordinator will call by telephone the appropriate commonwealth or local agency. Outside agencies will be contacted immediately in the case of fire, the release of hazardous gas fumes, smoke or a release of hazardous waste is discovered that cannot be readily controlled with on-site equipment, materials or personnel, and when his assessment indicates that local areas might need to be evacuated. Table G-3 lists the outside emergency contacts that may be contacted during an emergency. Table G-4 lists additional equipment available from off-site facilities.

TABLE G-3

OUTSIDE EMERGENCY ASSISTANCEEMERGENCY CONTACTS

<u>Contact</u>	<u>Location</u>	<u>Telephone</u>
Civil Defense	Penuelas	(809) 724-0214
Police Department	Penuelas	(809) 343-2020
Fire Department	Penuelas	(809) 343-2330
Hospital de Damas	Ponce	(809) 843-5151
Penuelas Medical Center	Penuelas	(809) 836-1651

REGULATORY AGENCIES

National Response Center	Washington, D.C.	(800) 424-8802
USEPA Region II	New Jersey	(201) 548-8730
Environmental Quality Board	San Juan	(809) 725-5140
USEPA - Puerto Rico Division	San Juan	(809) 724-7825

CONTRACTORS

Hays International	Penuelas	(809) 836-1290
Guayinilla Heavy Equipment	Penuelas	(809) 836-1112
Palaballaboa Heavy Equipment	Penuelas	(809) 840-3535
Lagares Sewage Service	Ponce	(809) 843-1475

TABLE G-3 (CONTINUED)  
OUTSIDE EMERGENCY ASSISTANCE

EMERGENCY CONTACTS

<u>Contact</u>	<u>Location</u>	<u>Telephone</u>
C.H. Heist Caribe Corp.	State Highway #385 Tallaboa, Penuelas, Puerto Rico	(809) 836-1290 (809) 843-3040
Eduardo Fraticelli Trucking	State Highway #385 Tallaboa, Penuelas, Puerto Rico	(809) 836-1610 (809) 844-3589
Carbide Hydroblasting Corp.	State Highway #385 Tallaboa, Penuelas, Puerto Rico	(809) 836-1110 (809) 844-0410
Tallaboa Heavy Equipment	State Highway #385 Tallaboa, Penuelas, Puerto Rico	(809) 836-1439 (809) 836-1074
Ponce Waste Disposal, Inc.	State Highway #1 Ponce, Puerto Rico	(809) 840-3535
CORCO	State Highway #127 Tallaboa, Penuelas, Puerto Rico	(809) 836-1508
Lagares Sewer Service, Inc.	Fagot Avenue 0-18 Ponce, Puerto Rico	(809) 840-4410 (809) 843-1475
Indochem Services, Inc.	El Tuque Indust. Pk Ponce, Puerto Rico	(809) 843-6595

Petrochemical Complex Mutual Aid Organizations

Commonwealth Oil Refining Co.	(809) 843-3030
Union Carbide Caribe	(809) 840-2626
PR Electric Power Authority	(809) 844-6595
Shell Oil Co.	(809) 782-0560
Texaco Oil Co.	(809) 836-1260
Industrial Chemical Corp.	(809) 836-1230
ESSO	(809) 836-1150

TABLE G-4

ADDITIONAL EQUIPMENT AVAILABLE FROM OUTSIDE HELPVacuum Trucks

Two	(2)	4,200 gals - Vacuum Trucks
Two	(2)	2,300 gals - Vacuum Trucks
One	(1)	3,000 gals - Vacuum Truck
One	(1)	2,500 gals - Vacuum Truck

Tank Trucks

Four	(4)	5,000 gals - Tank Trucks
Two	(2)	8,000 gals - Tank Trucks
Two	(2)	6,000 gals - Tank Trucks

Portable Pumps

Pumps	5, 10, 25, 50 gallons per minute; one each available
-------	--

Dump Trucks

Four	(4)	7 cubic yards capacity
Four	(4)	24 cubic yards capacity
Two	(2)	30 cubic yards capacity

Heavy Equipment

Three	(3)	Loaders 3 cubic yard capacity
Two	(2)	Backhoe 1 cubic yard capacity
One	(1)	Crawler Tractors D-6
One	(1)	Crawler Tractor D-7
One	(1)	Crawler Tractor D-8
Two	(2)	Wheel Tractor with Loader 1 cubic yard capacity
Two	(2)	Motor scraper and hauling unit - 14 cubic yard capacity
Two	(2)	Fork Lift
One	(1)	All purpose excavator with telescopic full rotating boom capacity 1-3/4 cubic yards

Fire Fighting Equipment

Two	(2)	Fire fighting trucks - water
Two	(2)	Fire fighting trucks - foam
Two	(2)	Dry chemical trucks

TABLE G-4 (CONTINUED)

ADDITIONAL EQUIPMENT AVAILABLE FROM OUTSIDE HELP

Hoses - Approximately 2,000 ft.

4, 6, 8 inch diameter(s)

Absorbent Material

Booms, Pads, etc.

Fully Equipped Ambulances

Three (3)

Van With Safety Equipment

Two (2)

The Petrochemical Complex Mutual Aid Organization is located in the area of Tallaboa which includes: Commonwealth Oil Refining Co., Union Carbide Caribe, PR Electric Power Authority, Shell, Texaco, Industrial Chemical Corp. The same is prepared to deal with emergencies such as fires, spills and accidents in the area. All the equipment in this area is available for these types of emergencies.

If the facility has had a release, fire or explosion which could threaten human health or the environment, the emergency coordinator will notify the National Response Center at (800) 424-8802 and report the incident. The notification will include the following:

- name and telephone number of the reporter
- name and address of the facility
- date, time and type of incident (e.g., spill occurring at 3:30 pm)
- identification of the source of characteristics and quantity of materials involved (e.g., 50 gallons of electroplating waste, container storage facility)
- the extent of injuries, if any
- an assessment of the possible hazards to the environment and human health outside the facility

**G-4b Identification and Assessment of the Emergency**

During the initial phase of the emergency response, a number of key decisions must be made by the emergency coordinator regarding imminent or potential hazards and the need for the protective actions. The emergency coordinator will visually identify the characteristics, exact source, amount and areal extent of any released materials in a non-acute emergency. An acute emergency will be assessed visually (with binoculars if appropriate) by the emergency coordinator immediately after the situation has occurred. Safety is the primary concern, followed by the need to stop the flow of contaminants, to extinguish any fires, and eliminate sources of ignition or leakage. The emergency response team will move in (with proper protective equipment) after the situation is under control to further evaluate the character, severity and exact source of the released materials. All spills will initially be considered hazardous. The emergency coordinator will visually identify and note the source of the incident, physical properties, and the direction of the wind.

Releases of unknown composition will be considered hazardous until proven otherwise by analysis or specific knowledge of the material. If information cannot be obtained on the types of materials released by direct observation or review of facility records (including but not limited to waste manifest, waste characterization sheets, and material safety data sheets), a sample of each physically different (color, viscosity, physical state) material will be collected and analyzed for the parameters selected by the Laboratory Manager, based on the location in the facility where the release has occurred and documented data from surrounding regulated units.

Certain procedures and equipment have been classified by EPA as suitable for obtaining representative samples of hazardous waste. Sampling procedures will follow those in the PROTECO Waste Analysis Procedures as shown in Appendix G.4.



Before sampling any released hazardous waste, the PROTECO sampling personnel will typically wear the following personnel protective equipment:

- disposal, chemical-resistant coveralls
- chemical-resistant glove and boots
- safety glasses or goggles
- chemical-cartridge respirator

The following procedures will be used for sampling unknown hazardous waste spills:

1. Don protective equipment.
2. Approach spill material from upwind (where possible).
3. Obtain soil/waste sample with trier or COLIWASA, label and place in a laboratory-cleaned sample bottle, and place sample on ice immediately after sample collection.
4. Use a different trier for each sample location and/or clean sampler between each sample point.

After the samples have been taken, they will be labeled and logged into the PROTECO laboratory log book.

The emergency coordinator will use Table G-5, Facility Design and Operation Release Potential, to assist him in determining potential hazards to human health or the environment.

#### G-4c Emergency Response Procedures

The EC is required to take a series of actions upon the discovery of an emergency situation, during the emergency control phase and immediately following the attainment of control. In order to develop an effective containment/cleanup strategy, the emergency coordinator must take the following information into consideration:

TABLE G-5

FACILITY DESIGN AND OPERATION RELEASE POTENTIAL

Release Source	Proposed Corrosive Storage Tank	Proposed Acid Storage Tank	Proposed Neutralization Storage Tank
Release Mode	Tank Failure	Tank Failure	Chemical Reaction, Tank Failure
Design Size	15,000 gallons	30,000 gallons	10,000 gallons
Secondary Containment	30,000 gallons	15,000 gallons	15,000 gallons
Waste Classification	Corrosive	Corrosive	Corrosive
Human Health Hazard	Dermal, oral, inhalation	Dermal, oral, inhalation	Dermal, oral, inhalation
Environmental Hazard	High	High	Medium
Explosive Hazard	Low	Low	Low
Fire Hazard			
Time Required to Empty tank with on-site equipment & off-site equipment	5 hours	10 hours	3 hours 20 min.
Major Equipment to use	Vacuum Truck/ or Tankers	Vacuum Truck/ or Tankers	Vacuum Truck/ or Tankers

TABLE G-5 (CONTINUED)  
FACILITY DESIGN AND OPERATION RELEASE POTENTIAL

<u>Release Source )</u>	<u>Stabilization/ Fixation Facility</u>	<u>Surface Impoundments</u>	<u>Proposed Container Storage Area</u>
Release Mode	Batch Tank Failure	Liner Failure	Drum Failure
Explosion Fire			
Design Size	2,000 gallons	100,000 gallons	8,640 sq. ft.
Secondary Containment	Double Wall Tank	100,000 gallons*	Cement Curb
Waste Classification	Flammable Toxic Corrosive	Ignitable Toxic	Flammable Toxic Corrosive
Human Health Hazard	Dermal Inhalation Oral	Dermal Inhalation Oral	Dermal Inhalation Oral
Environmental Hazard	Toxic	Medium	Toxic
Explosive Hazard	High	Low**	High
Fire Hazard	High	Low**	High
Time Required to empty with on-site equipment & off-site equipment	13+ hours when full	24 hours when full	10 + when full
Major Equipment to use	manual pump/ Tanker Truck	Vacuum Trucks or Tankers	Fork Lift Vacuum Truck Intrinsically safe pump, hose with ground wire.

\* Self-Contained due to triple-liner system

\*\* Could only result from Major Spill during  
unloading/loading operations

TABLE G-5 (CONTINUED)  
FACILITY DESIGN AND OPERATION RELEASE POTENTIAL

<u>Release Source</u>	<u>Proposed Solvents Storage Tanks</u>	<u>Proposed Oils Storage Tanks</u>	<u>Proposed Aqueous Waste Storage Tank</u>
Release Mode	Tank Failure Explosion Fire	Tank Failure	Tank Failure
Design Size	30,000 gallons (2 tanks)	60,000 gallons (2 tanks)	15,000 gallons
Secondary Containment	Curb	Curb	Curb
Waste Classification	Ignitable Toxic	Ignitable Toxic	Toxic
Human Health Hazard	Dermal Inhalation Oral	Dermal Inhalation Oral	Dermal Inhalation Oral
Environmental Hazard	High	Medium	Medium
Explosive Hazard	High	Medium	Low
Fire Hazard	High	Medium	Low
Time Required to empty with on-site equipment & off-site equipment	5 hours	5 hours	5 hours
Major Equipment to use	Vacuum Trucks/ or Tankers	Vacuum Trucks/ or Tankers	Vacuum Trucks/ or Tankers

- physical state of spilled waste (solid, liquid, sludges, slurries)
- container characteristics
- spill situation (storage, treatment, transportation)
- potential fire or explosion hazards
- area that is affected
- environmental factors (e.g., weather conditions, wind direction)
- time of incident

The following subsections describe the initial response procedures that are taken by the facility during an emergency situation and the specific procedures that are use by emergency response personnel for the containment and cleanup of spills, fires or explosions.

G-4c(1) Initial Response Procedures. Initial response procedures to be taken by the facility personnel and the emergency coordinator are described below. These procedures are to be used for every emergency situation.

1. Any employee or security guard discovering or causing an emergency situation (spill, leaking drum) must immediately contact one of the emergency coordinators in the order described in Appendix G.1.
2. The employee or security guard will describe the emergency situation giving a brief description of the emergency, the exact location of the emergency, time of occurrence, accessibility to the emergency and the type and quantity of waste spilled, if possible.
3. By considering the nature of the emergency (i.e., leaking drum, spill or fire) the emergency coordinator will perform the following tasks:
  - a. Assess the degree of hazard to operating personnel, emergency personnel and the surrounding area;

- b. Notify all personnel on site of the emergency and stop all waste processing and disposal activities, in the emergency area or site wide when necessary;
  - c. Make and execute the decision to evacuate personnel from the affected area, when necessary;
  - d. If the released waste cannot be identified, collect and analyze a representative sample;
  - e. Make the decision to call outside organizations (Table G-4) and/or the National Response Center;
  - f. Will establish a staging area outside the danger zone where all personnel and equipment report in and receive their orders;
  - g. Select the appropriate personnel protective equipment; and
  - h. Formulate the response operation plan.
4. When the emergency coordinator makes a decision to evacuate the facility, the supervisors will be notified and the alarm system will be activated. Upon hearing the alarm, all employees must leave their work areas and evacuate the premises, as described under evacuation procedures (Section G-7).
  5. The emergency coordinator will take all necessary measures to contain the hazard within the area of the facility and to prevent its spread to the environment and to the areas adjoining the facility boundaries.
  6. Safety measures will be taken to ensure maximum protection of the safety and health of the emergency response personnel to include the use of appropriate personnel protective equipment. At a

minimum, this personnel protective equipment will include the following:

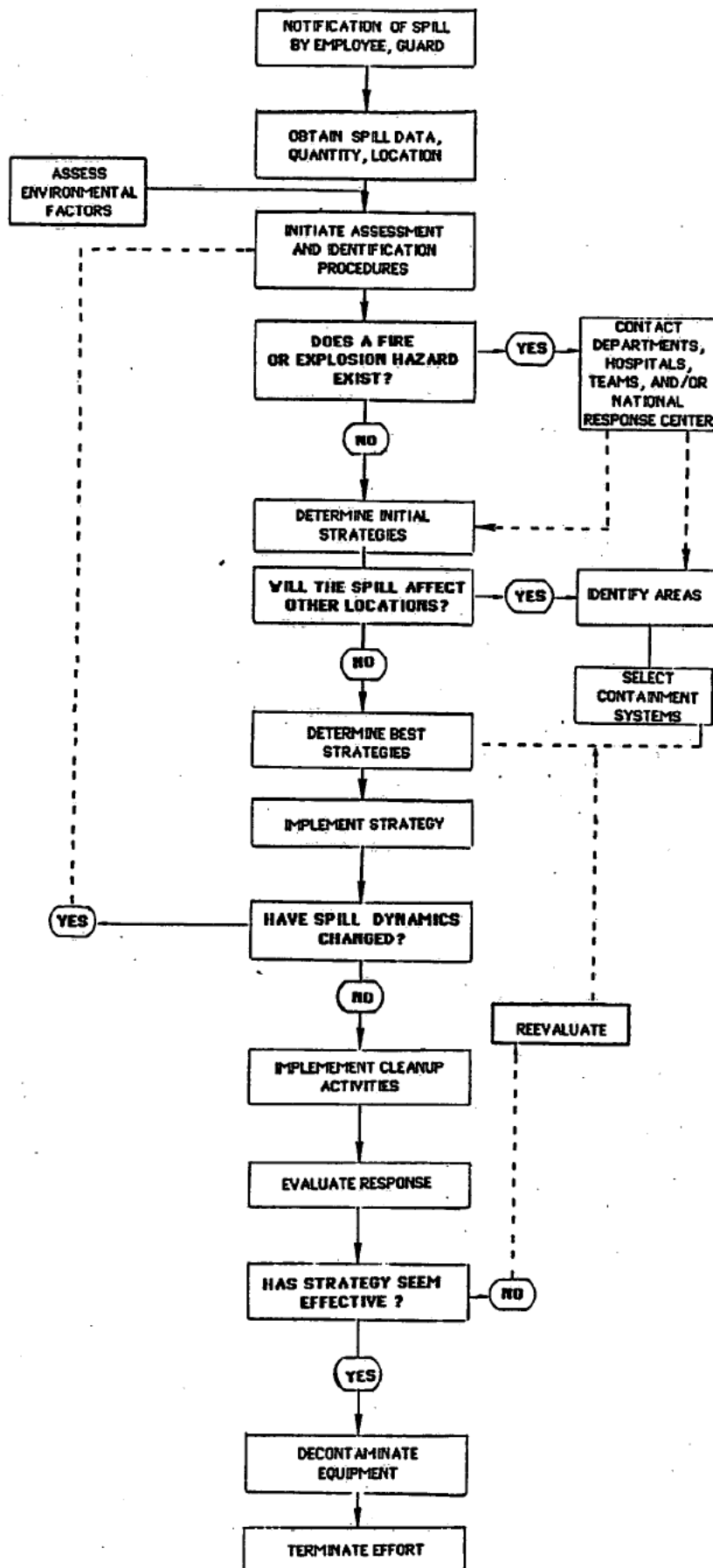
- a. disposable, chemical-resistant coveralls
  - b. chemical resistant gloves and boot
  - c. safety glasses or goggles
  - d. chemical-cartridge respirator
  - e. hard hats
7. All non-emergency response personnel will be moved from the hazard area and any established buffer zone areas until the emergency has been taken care of.
8. Upon the arrival of emergency response personnel and/or outside organizations the emergency coordinator will brief them regarding the potential or actual hazards, the location of the emergency, the containment procedures to be used and the appropriate personnel protective equipment.

G-4c(2) Spill Response Procedures. The goal of the spill response is containment and cleanup of the spilled material without hazard to human health or the environment. During a spill event, the emergency coordinator may instruct all employees and contractors to immediately stop all waste treatment operations (stabilization/fixation and neutralization) and to stop additions of waste to any area. This may include rejection of shipments of hazardous waste to the facility. This action will be taken so that all equipment materials and personnel can be focused on the emergency. Figure G-3 provides a flow chart to be used by the emergency coordinator during emergencies involving spills and the following pages list the procedures to be followed by the emergency response personnel.

G-4c(2)a Containment and Cleanup of Liquid or Slurry Spills.

1. Berm ahead of the spill for containment of the liquid

FIGURE G-3

FLOW CHART FOR SPILL RESPONSE

2. Stop flow of the liquid at source by one of the following methods:
  - a. plug hole in drum or tank using putty
  - b. turn off valve/drain if applicable
  - c. upright overturned container
  - d. place drum in an oversized drum
3. In the case of a small spill (under 50 gallons) place the appropriate absorbent material on the spill. (Table G-6 outlines the properties of the spill control materials used by PROTECO.)
4. In the case of a large spill (greater than 50 gallons), the emergency response personnel will build berms and trenches to direct the flow to depressed areas for easy collection. When liquids have entered small intermittent drainages, it may be possible to construct a dam to stop the downstream flow. Berms, trenches and dams can be constructed using hand tools or heavy equipment (D-6, backhoe, loader), with native soil and absorbent pads. When necessary, the liquid will be pumped into containers, tanks or impoundments. Then the appropriate absorbent material will be placed on the spill.

Commercial sorbent materials for spill cleanup may be used as barriers to overland or water-borne flow as long as they do not become saturated. Rolls of sorbent should be deployed at the perimeter of a terrestrial spill. Sorbent sheets may also be placed around the leading edge of the spill. Table G-7 outlines the properties of the native soil at the site. This soil is good for construction of temporary dikes, berms and dams due to its high fines content, clay content and compaction properties.

5. If the released waste is an ignitable material, special precautions regarding flammability must be taken. No sparks, flames, arcs or heated items will be used in area.

TABLE G-6

SPILL CONTROL PROPERTIES OF ABSORBENT MATERIALS  
USED AT PROTECO

<u>Material</u>	<u>Usage</u>	<u>Bulk Density of Material (lbs/cubic ft.)</u>	<u>Gallon of Contaminant Attenuated Per Pound of Material (gallons)</u>	<u>Capacity for Absorption By Volume of Material (percent)</u>	<u>Bags of Material Required per 5 gal Spill</u>
Speedi-Dri	Absorption of non-chlorinated and chlorinated solvents, oils	30 - 40	0.11 - 0.13	50 - 60	1 1/2*
Vermiculite	Absorption of acid or alkaline waste spills, aqueous materials, oils	30 - 40	0.11 - 0.13	50 - 60	1 1/2*
Cement Kiln Dust	Absorption of EP Toxic solutions and sludges, waste lindane solution and other toxic materials	100	0.08 - 0.11	40 - 50	N/A

\* Calculation assumes a 50 percent excess quantity of adsorbent material over the theoretical amount required to adsorb a 5 gallon spill.

TABLE G-7

SUMMARY OF SOILS LAB WORK

<u>Boring No.</u>	<u>NI1</u>	<u>PI F-1</u>	<u>IF-2</u>	<u>IF2-A</u>
Soils Description	Brownish white sandy silt	Brown to olive brown sandy silt come clay	Pale brown olive brown silty clay traces of fine sand	Pale brown, olive mottle, silty clay traces of pebbles and fine sand
Grain size % passing No 200 seive	-	-	86.6%	-
Depth	0-6'	0-4'	2' @ 5'	2.5' @ 5'
Moisture Content	18%	20%	26.9%	

6. Shovels and/or a bulldozer will be used for cleaning up the contaminated absorbent material and soil. All contaminated and discolored soil will be scraped up within 12 inches of the spill surface soil.
7. All contaminated materials and soil will be placed in 55 gallon drums compatible with the contaminants and the drums will be marked with the appropriate DOT labels and markings.
8. All materials (contaminated absorbent, soil, disposable equipment and the water used to decontaminate the equipment) generated by the emergency response personnel will be treated and disposed of at the PROTECO facility.
9. All reusable equipment will be decontaminated.
10. The emergency coordinator will ensure that all emergency equipment is restored to full operational status by the emergency response personnel. Appendix G.3 provides a checklist to be completed by the emergency coordinator after each incident.
11. The emergency coordinator will investigate the cause of the emergency and will take steps to prevent the recurrence of such an incident.
12. The emergency coordinator will notify the EPA, EQB and local agencies where applicable.
13. If necessary, the emergency coordination will submit a written report of the incident to the Administrator of EPA Region 2.

G-4c(2)b Containment and Cleanup of Sludge and Solid Spills.

1. Stem the flow to prevent further spills by using plugs, patches, reinforcing the container or uprighting the container.

2. If it is extremely windy and the waste is dry and granular, cover the spilled waste with plastic sheeting to prevent dispersion. During clean up, the cover will be folded back to expose only the waste to be shoveled immediately.
3. Using a shovel to clean up the spilled waste and the contaminated soil, place into containers which have been determined to be compatible with the released material.
4. If the spill occurred due to a damaged container, enclose the container in an over-pak or transfer the contents of the container to a new drum. Label and mark drum as required by DOT.
5. Decontaminate all reusable equipment and put disposable equipment into one of the spill cleanup containers.
6. Mark and label any containers used to hold spilled and contaminated materials according to applicable DOT regulations.
7. The emergency coordinator will ensure that all emergency equipment is restored to full operational status by the emergency response personnel. Appendix G.3 provides a checklist to be completed by the emergency coordinator after each incident.
8. The emergency coordinator will investigate the cause of the emergency and will take steps to prevent the recurrence of such an incident.
9. The emergency coordinator will notify the EPA, EQB and local agencies where applicable.
10. If necessary, the emergency coordinator will submit a written report of the incident to the Administrator of EPA Region II.

G-4c(3) Fire and/or Explosion Response Procedures. The following provides the procedures to be followed if a spill of a volatile ignitable waste, a fire and/or an explosion occurs.

1. The emergency coordinator will determine if a fire or explosion hazard exists or has occurred from the information provided during the notification
2. The emergency coordinator will notify the Penuelas Fire Department (343-2330) and the local civil defense department 724-0124). The facility can be accessed by the fire fighting vehicles and related equipment from these organizations.
3. If a fire should break out, emphasis will be placed on preventing the fire from spreading to nearby areas and to other sections of the facility where ignitable wastes are handled by providing trenches as fire barriers. When possible, ignitable waste will be moved away from the fire area. Reactive wastes are not treated/stored/disposed of at this facility.
4. All ignition sources must be eliminated within the emergency zone. These include open flame, hot objects, sources of static discharge, sparks from electrical equipment, and ferrous tools that can strike a spark. Radios, motors or pumps used within the zone must be explosion proof.
5. The emergency coordinator will take measures to ensure maximum protection for the safety and health of emergency response personnel, outside assistance areas surrounding the facility.
6. The emergency coordinator will have the emerging response personnel activate the facility fire fighting system.
7. After the ignitable vapors have been dispersed and the fire eliminated, shovels and/or bulldozers will be used to clean the

hazard area by scraping up contaminated soil. All waste generated from the containment and cleanup will be disposed of as hazardous waste.

8. Following containment and control of the emergency, the EC will provide for the collection, treatment and/or disposal of the wastes, contaminated soil, water or other materials generated from the cleanup of the emergency situation. All disposable equipment will be placed in one of the spill cleanup containers. These containers will be labeled and marked as required by DOT.
9. The emergency coordination will ensure decontamination of all reusable equipment.
10. The emergency coordinator will ensure that all emergency equipment is restored to full operational status by the emergency response personnel. Appendix G.3 provides a checklist to be completed by the emergency coordinator after each incident.
11. The emergency coordinator will investigate the cause of the emergency and will take steps to prevent the recurrence of such an incident.
12. If necessary, the emergency coordination will submit a written report of the incident to the Administrator of EPA Region II.
13. The emergency coordinator will notify the EPA, EQB and local agencies where applicable.

G-4c(4) Leak or Spills from Tanks. During a tank spill event, initial efforts should be made to stop the flow of waste causing the leak. If liquid is overflowing in a tank, waste feeds should be shut off (if the automatic system has not already done so). In the event of a piping leak, the pump feeding the pipe should be shut off and valving closed to isolate the piping section leaking.

If a tank is leaking from a seam, no action is necessary until it can be safely determined that a surface impoundment or other tank can safely receive the tank's contents. (Under normal circumstances, the contents of a leaking tank will be fully contained within the concrete secondary containment area.) It should also be noted that pumping systems for some tanks (solvents and oils) also contain provisions for transfer of tank contents to tank trucks; this is another option during emergency events.

In the event of a spill from a truck unloading wastes, the truck unloading areas have sumps and piped gravity drainage connections to the stormwater holding impoundment adjacent to the Tank Farm. This impoundment is also designed for use in the event that contaminated stormwater must be moved from a secondary containment area to maintain facility operations. (Note: small spills from unloading operations will be retained within the sump and will not overflow to the impoundment. These may be removed by pump and fed into the storage/treatment tanks, by waste class.)

Spills of ignitibles require special care in applying response procedures. The following guidelines apply:

- any spark or other source of ignition could turn a spill event into an explosion or fire. Responses must be carefully thought out (including activation/deactivation of electrical systems).
- Pumps, pipes, containers and tank trucks used for ignitable waste transfer must be grounded, and grounded in the proper order.
- Foam in containment areas carries the danger that ignitibles may be building up in concentration under the foam (and above sprayed water), without being visually noticed.

Thus, ignitable waste spill cleanup should be approached cautiously, using methods which will not result in introducing sources of ignition.

Additional procedures for containment and cleanup of tank spills and leakage may be found under Section G-4c(2)a.

In the event of a leak or spill from the proposed tank facilities, all hoses, hatches and drains will be checked and closed if open. If the waste spill is not contained within the secondary containment area, an area of isolation will be established around the release. The separate Stormwater Holding Impoundment can also be used for containment if the waste is compatible with the liner. The size of the area will generally depend on the size of the spill and the waste involved. If the spill is large and involves a tank rupture, an initial isolation of at least 100 feet in all directions will be used. Small spills or leaks from the tanks or hose will require evacuation of at least 50 feet in all directions to allow cleanup and repair. When any spill occurs, only emergency response personnel will be allowed into the designated hazard area as directed by the emergency coordinator. As soon as possible, the area will be roped or otherwise blocked off. Containment and cleanup will use the procedures described in Sections G-4a and G-4b.

G-4c(5) Leaks or Spills from Surface Impoundments. The surface impoundment will be inspected weekly and after every storm to determine if a sudden drop of the level of liquids has occurred or if leaks have developed in the liner. If either of these situations are observed during an inspection, the inspector will immediately notify the emergency coordinator. The emergency coordinator will have the facility stop all additions to the surface impoundment and will authorize any surface leakage that has occurred or is occurring to be isolated. The size of the isolation area will depend on the size of the leak and the waste type involved. Only emergency response personnel will be allowed within 50 feet of the isolation area. All emergency response personnel will wear proper protective equipment.

The isolation area will be contained by building dikes with absorbent pads and/or dirt. The flow will be directed to depressed areas in the diking system for easy collection, and then directed into the other surface impoundments.

For small spills the appropriate absorbent material (see Table G-5) will be added to absorb free liquid. For spills of 25 to 100 gallons, the

liquid will be pumped into approved DOT containers. For spills of 100 to 2,000 gallons, the vacuum truck will be used to remove and store the liquids. All the waste and cleanup materials shall be considered hazardous waste and will be treated and disposed of by the facility.

If a leak cannot be stopped by any other means, the surface impoundment will be emptied and transferred to one of the other surface impoundments using the on-site equipment 2,000-gallon vacuum truck and a 50 gpm at 30 psi pump. There are three surface impoundments which could be used for waste transfer. Surface impoundments at PROTECO have been designed such that adequate remaining capacity will be available when any single impoundment is out of service, thereby facilitating better spill response capabilities. Referring to Table G-4, the total capacity of vacuum trucks and tanker trucks which can be called in to assist in this dewatering activity is 66,500 gallons.

G-4c(5)a Impoundment Emergency Repairs [40 CFR 264.227]. In the event of a sudden drop in the level of liquids in any impoundment the following procedures will be followed:

- the emergency coordinator will be notified
- the emergency coordinator will call over the two-way radio and instruct an employee to stop waste addition (shut down pumping systems or change valving)
- the employee will call back to confirm that the waste addition has been stopped.

Analysis will then be made by the EC to determine whether any additional measures are necessary. No additional waste will be added until it is assured that liner integrity has been restored.

G-4c(5)b Preventing Catastrophic Failures. Inspection procedures to help prevent catastrophic failures have been developed for this facility.

These include inspection requirements for the safety and emergency equipment, security, Container Storage Facility, Tank Farm Stabilization/Fixation Facility, Surface Impoundments and Landfills. All facilities have been designed to appropriate federal, Commonwealth and building code standards, which should prevent catastrophic failures from occurring.

In the event one of the facilities used to store liquids fail, their contents will be removed and placed in the surface impoundments and/or one of the storage tanks. The vacuum truck or chemical pump will be used to transfer the material along with outside equipment as needed (Table G-4).

G-4c(5)c Emptying the Impoundments. A list of the equipment to be used to empty impoundments can be found on Table G-8. The liquids will be: 1) transferred to another impoundment or tank; 2) transferred using the vacuum truck to the Stabilization/Fixation Facility; or 3) pumped into contracted tanker trucks for storage prior to treatment/disposal in the Tank Farm or Stabilization/Fixation Facility.

Sludge in the bottom of the impoundment will be processed in the Stabilization/Fixation Facility.

G-4c(5)d Certification and Repairs as a Result of Sudden Drop Double-Lined Landfills or Surface Impoundments. The following are procedures to be taken in the event of a liquid leak into the leak detection system in the Landfills or Surface Impoundments:

- The employee will notify the emergency coordinator of the event and the depth of the liquid in the detection manhole.
- The emergency coordinator will instruct his employees to stop all waste additions into the landfills or Surface Impoundments.
- The emergency coordinator will instruct his employees to take a sample which will be sent to the on-site laboratory for analysis.
- The emergency coordinator shall send a report to the EPA Regional Administrator within seven days of the leak occurrence.

TABLE G-8  
EMERGENCY EQUIPMENT LOCATIONS

<u>Material/Equipment</u>	<u>Location</u>	<u>Use</u>
Vermiculite	Container Storage Facility	For small spills of oil, acids or caustics, aqueous materials
Speedi-dry	Container Storage Facility	For small spills of oil, non-chlorinated/chlorinated solvents, aqueous materials
Cement kiln dust	In proposed silos. Stabilization/Fixation Facility-	For spills of sludges, solids, toxic materials, lindane waste
Soda ash	Container Storage Facility	For spills of waste acid solutions
Caliche	Borrow areas	To build dikes and for preventing run-off controls
Absorbent pads	Container Storage Facility	Most organics. Do not use for acids.
55-Gallon drums; Steel, polyethylene	Container Storage Facility	Organics, contaminated absorbent materials (steel); acids, caustics, contaminated absorbent materials (polyethylene)
Shovels	Main Facility	Excavation, spill-cleanup
Pump (175 psi, 200 pm)	Stabilization/Fixation Facility	Excavation, spill
Vacuum truck	Maintenance Facility	Spill cleanup
Pickup trucks	Laboratory Facility	Spill cleanup
Front-end loader	Stabilization/Fixation Facility	Excavation, spill cleanup, building emergency dikes
Dump trucks	Stabilization/Fixation Facility	Debris removal, material delivery.

TABLE G-8 (CONTINUED)  
EMERGENCY EQUIPMENT LOCATIONS

<u>Material/Equipment</u>	<u>Location</u>	<u>Use</u>
Backhoe	Maintenance Facility	Dig trenches, berms, dikes and cleanup of spilled material
D-6	Landfill Facilities	Dig trenches, berms and dikes compact soil.
1-1/2 inch hose	Maintenance Facility	
Two gallon buckets with handles	Maintenance Facility	For spills of sludges, oils, and adsorbent
Five gallon buckets with handles	Maintenance Facility	For spills of sludges, oils, and adsorbent
Sheets of Plywood 5/8" quartered (2'x 4')	Maintenance Facility	To build dams in culverts, berms
Visqueen	Maintenance Facility	To build dams, keep waste from being adsorbed by the ground
Reinforced Plastic Bags	Container Storage Facility	Temporary storage of soil, absorbents contaminated materials
Scott Air Packs	Container Storage Facility	Protective equipment
Air Tanks	Maintenance Facility	Protective equipment
Hard Hats	Maintenance Facility	Protective equipment
Gloves	Maintenance Facility	Protective equipment
Eyewash Stations	Container Storage Facility, Tank Farm Stabilization/Fixation Facility	Protective equipment
Decontamination Shovers	Container Storage Facility, Tank Farm, Stabilization/Fixation Facility	Protective equipment
Fire Extinguishers	As shown in Figures G.5-1, 2, 3	Fire protection

- The emergency coordinator will confer with an engineer and/or the material supplier to determine the best method to fix the problem. One solution would be to remove the waste, locate the leak, remove the liner material and install a patch. As part of this review a determination will be made as to the integrity of the secondary liner. A letter of certification will be obtained from a qualified engineer stating that the leak(s) had been repaired or the matter will otherwise be resolved with regulatory agencies before waste input to the unit is restarted.

G-4c(6) Container Spills and Leakage [40 CFR 264.52, 264.171]. Action will be taken immediately after an assessment has been made as to the health and safety of employees, to contain, remove, store/treat/ dispose of spilled material. Generally, the type of the spilled waste will be known and the time to don safety equipment and start the clean-up will be short.

Procedures for responding to spills and leakage may be found under Section G-4c(2), Spill Response Procedures.

The following are additional guidelines to be followed when responding to container spills and leakage:

Rotate The Container. For simple non-pressurized containers such as drums, the simplest way to stop flow from a leak is to turn the container so the leak is at the topmost point of the container.

Attempt To Decrease The Pressure. Decreasing pressure on many containers can substantially reduce the rate of flow from a leak. For a non-pressurized container, the goal is to restrict entry of outside air into the leaking container.

G-4c(7) Contingency for Treatment and Disposal of Released Material (264.56(g)). In the event that existing treatment and disposal facilities are unavailable during emergency events. PROTECO will call in outside contractors. Those contractors will supply pumps (to convey spilled

material into the trucks), cement kiln dust, dust transfer equipment and heavy construction equipment for use in building an emergency storage facility.

#### G-4d Prevention of Recurrence

Within 48 hours of the deactivation of the Contingency Plan (following an event requiring its activation), the facility's Director of Operations and Lab Manager will meet with the responding Emergency Coordinator to review the circumstances surrounding the event necessitating Contingency Plan activation. Reviewed will be:

- factors leading up to the event
- response to the event
- ways to prevent a recurrence

If changes in facility operations procedures, construction procedures or redesign of facilities are necessary, such changes will be implemented by the Director of Operations as as soon as reasonably possible.

#### G-4e Incompatible Waste [40 CFR 264.56(h)(1)]

PROTECO does not place hazardous waste received at the facility or generated from spills in an unwashed container. In this way, PROTECO prevents reactions from occurring between incompatible wastes and containers previously holding a different hazardous waste.

The emergency coordinator will refer to Table G-9 to confirm that the material and containers are compatible. Additional information can be obtained from Section G-4c(2), Spill Response Procedures.

One of the initial steps taken by the EC is to determine the source and extent of released material in the case of a spill or leak. Upon this determination all incompatible wastes will not be treated, stored or located within the affected area until clean-up procedures are completed.

TABLE G-9

COMPATIBILITY CHART: CHEMICALS VERSUS  
CONSTRUCTION AND LINING MATERIALS

<u>Construction Material</u>	<u>Chemicals Incompatible With</u>
Steel	Mineral Acids: nitric, hydrochloric, sulfuric acids
Aluminum	Alkalies: potassium hydroxide, sodium hydroxide, mineral acids
Magnesium	Mineral acids
Lead	Acetic acid, nitric acid
Copper	Nitric acid, ammonia
Nickel	Nitric acid, ammonia
Zinc	Hydrochloric acid, nitric acid
Tin	Organic acids, alkalies
Titanium	Sulfuric acid, hydrochloric acid
<u>Lining Materials</u>	<u>Chemicals Incompatible With</u>
Alkyds	Strong mineral acids, strong alkalies, alcohols, ketones, esters, aromatic hydrocarbons
Vinyls (polyvinyl)	Ketones, esters, aromatic hydrocarbons chloride-PVC)
Chlorinated Rubbers	Organic solvents
Epoxy: (amine-cured, polyamide-cured or esters)	Oxidizing acids (nitric acid), ketones
Coal Tar Epoxy	Strong organic solvents
Latex	Oxidizing acids, ketones, esters
Polyesters	Oxidizing acids, strong alkalies, mineral acids, ketones, aromatic hydrocarbons
Silicones	Strong mineral acids, strong alkalies, alcohols, ketones, aromatic hydrocarbons

**G-4f Post-Emergency Equipment Maintenance [40 CFR 264.56(h)(2)]**

Reusable equipment emergency will be cleaned and inspected. All activities in this area will be noted on the Emergency Equipment Checklist, which will be kept a part of this plan. It will be the responsibility of the emergency coordinator to see that all non-functioning equipment is repaired and that critical equipment is replaced immediately with new or rental equipment.

The emergency coordinator will be responsible for ensuring that all necessary emergency equipment is clean and fit for use before operations are resumed within unaffected areas of the site. An emergency equipment checklist has been included as a part of this plan.

Equipment which malfunctions during the emergency will be repaired by a qualified technician or will be sent back to the supplier/factory for repair and/or replacement. Heavy equipment will be washed down with high pressure water and/or steam cleaned. The cleaning liquids will be collected and stored for treatment/disposal in the Stabilization/Fixation Facility. All mechanical equipment will also undergo a systems check performed by a certified mechanic. Empty fire extinguishers and air packs will be sent back to the supplier for refilling and retesting/certification. Non-reusable equipment, such as absorbents, will be replaced.

G-5 Emergency Equipment  
[40 CFR 264.32 and 264.52(e)]

The following section describes the available equipment that can be used in an emergency and the proposed schedule for purchasing of additional emergency equipment. Table G-10 provides the proposed schedule for obtaining this additional equipment. Appendix G.5 describes the locations for all of the emergency equipment.

G-5a Internal Communications

All PROTECO facility vehicles that enter the facility are provided with two-way radio systems so that personnel can contact the laboratory, and hence, the emergency coordinator in case of an emergency situation. Security guards are provided with two-way radios to facilitate internal communications during an emergency. The telephone numbers of the primary and alternate emergency coordinators and emergency numbers for outside assistance are located in the guard shack and at the receptionist desk in the office and at the new laboratory facility on-site.

In addition to the existing emergency warning system the proposed new facilities will incorporate the alarm system shown in Appendix G.5.

G-5b External Communications

PROTECO is equipped with the following equipment to provide external communications availability and access at the facilities:

- a radio system installed in all facility trucks which provide communication from the active portions of the facility to the laboratory and office
- two-way radios for security guards and each working group

TABLE G-10

Proposed Emergency Equipment

<u>Item</u>	<u>Quantity</u>	<u>Date</u>
Vermiculite	10 50-lb bags	July 1986
Speedi-Dry	10 50-lb bags	July 1986
Caliche	10 50-lb bags	Purchased
Two Gallon Bucket with Handles	5	Purchased
Five Gallon Bucket with Handles	5	July 1986
Sheets of Plywood 5/8" quartered (2' x 4')	4	July 1986
Reinforced Visqueen	2 rolls	July 1986
Reinforced Plastic Bags	50	July 1986
Scott Air Packs	2	Purchased
Air Tanks (for above)	2	Purchased
Hard Hats	24	Purchased
Shoulder Length Gloves	3 pair	Purchased
Hand-Held Air Horn	10	Purchased
Eye Wash Stations	6	As new facilities are constructed
Decontamination Showers	6	As new facilities are constructed

- a telephone located at the laboratory and new office facilities which may be used to summon assistance from local police and emergency teams.

The telephone system can call anywhere on the island. The walkie-talkies have a 60 mile range.

#### G-5c Emergency Equipment

A list of available emergency equipment for the containment and clean-up of spilled hazardous waste is provided in Table G-8. As indicated, absorbent materials will be stored in a number of areas, while earthmoving vehicles will be located in either landfill areas. The standard absorbents are strategically located throughout the facility to facilitate rapid response effort. Procedures to be taken to ensure decontamination of this equipment and a checklist used by the emergency coordinator to determine equipment functionability is provided in Appendix G.4. In addition, all spill control, safety and fire control equipment is inspected monthly and a log of the inspection is kept for three years.

#### G-5d Additional Water Supply

New facilities include a water main and a 500,000 gallon firewater storage tank.

#### G-5e Safety Equipment

Protective clothing and equipment is utilized to protect employees during normal and emergency operations. Safety glasses and steel-toed boots or shoes constitute the minimum clothing requirements. The laboratory or Observation Post will be the predominant storage locations for the protective equipment, which includes the following:

- Scott air packs
- disposable chemical-resistant coveralls
- rubber/Neoprene boots

- rubber/Neoprene gloves
- chemical cartridge respirators
- full face masks
- non-toxic particle mask

First aid kits will be kept at the laboratory and in all waste transportation equipment (i.e., dump trucks, tankers, flatbed). In addition, PROTECO will also keep a Medical First Aid Chest in the laboratory. Emergency eyewash stations are located in all new facilities and Observation Post. Decontamination showers will also be located at the new facilities; Tank Farm, Container Storage Facility and the Stabilization/Fixation Facility.

#### G-6 Coordination Agreements [40 CFR 264.53]

PROTECO has made arrangements to familiarize the agencies and companies listed below with the original facility contingency plan, facility layout, access roads, hazardous characteristics of wastes handled, and evacuation routes by holding a meeting with the agencies described in Appendix G.6.

The letters sent to these facilities shown in Appendix G.6 outline the type of agreement that PROTECO would like to establish with them.



A copy of the original contingency plan will be maintained at the laboratory office on site. A copy of the new contingency plan as provided herein and all subsequent revisions is and will be maintained at the facility and submitted to all of the agencies listed above. Table G-11 provides the proposed schedule for obtaining local review of this revised Contingency Plan.

#### G-7 Evacuation Plan [40 CFR 264.52(f)]

In the event that a hazardous waste incident would present an imminent threat to personnel health, life or safety, the emergency coordinator will initiate the following evacuation procedures, by contacting the facility personnel and/or security guards on the radio-telephone and/or walkie-talkie. Only the emergency coordinator can initiate facility evacuation. Evacuation routes are shown in Figure G-4.

1. The emergency coordinator has assessed the situation and deems it necessary to evacuate the facility. He will contact the facility personnel and/or security guards on the two-way radio.
2. The security guards will proceed to the facility access gate. No further entry of personnel, visitors, contractors or trucks will be permitted.
3. Supervisors will designate the safest evacuation access route for his employees to take and will also choose an alternate route in case the first choice is inaccessible or down wind of the emergency. The primary evacuation point from the site will be through the main gate at the south end of the facility. The secondary evacuation point will be on the north west section. Employees exiting here will proceed in a northwest direction up the drainage bed.
4. The supervisors will use the horns to sound the emergency signal. The signal will be two short blasts and one long blast. This signal will be repeated five times.

## TABLE G-11

PROPOSED SCHEDULECoordination Agreements

<u>Item</u>	<u>Date</u>
Send out copies of contingency plan to various agencies outlining responsibilities	June 16, 1986
Review agencies' comments	May 1986
Make any necessary corrections	June 1986
Hold meeting	July 15, 1986
Conduct additional conversation on plan	July 1986



① TO HIGHWAY  
P.R. 385  
② TO  
BO. SEBORUCO

EVACUATION GATES

# List of Facilities

1. Truck Decoutamination Build.
- 2&3 Laboratory/Office Building
4. Tank Farm
5. Stabilization Building
6. Container Storage Building
7. Landfill II
8. Sediment Pond
9. Leachate Pond A
10. Leachate Pond B
11. Landfill I
12. Existing Land Treatment Area

1 primary route  
2 alternate

FIGURE G-4  
PROPOSED FACILITIES  
EVACUATION ROUTES

5. All personnel, visitors and contractors will exit through the access gate or secondary escape point. All employees will be accounted for by their supervisors who will report in to the emergency coordinator. The emergency coordinator will check the log book to account for all personnel visitors.
6. No personnel shall remain or re-enter the facility unless specifically authorized. Those allowed to enter the facility will normally include emergency coordinator, emergency response personnel and any outside assistance groups contacted.
7. Re-entry into the affected area will occur only after proper clearance is given. Situations which would warrant partial or complete evacuation of the facility would include:
  - spills or chemical reactions resulting in highly toxic fumes;
  - fire, when it cannot be contained and is spreading to other parts of the facility;
  - fire that could generate highly toxic fume, or an explosion.

Evacuation drills will be held bi-annually to practice the implementation of all the above procedures and are to be treated with the same seriousness as an actual emergency. If new roads are built, these routes will be revised.

The emergency coordinator will revise the evacuation procedures when the drills or actual implementation show that new procedures are needed.

G-8 Required Reports [40 CFR 264.56(i) and (j)]

The PROTECO facility manager must notify the EPA Region II Administrator, the Puerto Rico Environmental Quality Board and local authorities that the facility is in compliance with Section 265.56(h) of the Federal Regulations before operations at the facility are resumed in the areas affected by the emergency.

Within 15 days after an incident requiring implementation of the contingency plan, the facility manager or emergency coordinator shall submit a written report on the incident to the EPA Region II Administrator and the Puerto Rican Environmental Quality Board. A copy of the report will be kept as part of the contingency plan. A copy of the report form is provided in Figure G-5. The report includes the following information:

1. Name, address and telephone number of the owner or operator.
2. Name, address and telephone number of the facility.
3. Date, time and type of incident.
4. Name and quantity of materials involved.
5. The extent of injuries, if any.
6. An assessment of actual or potential hazards to human health or the environment where this is applicable.
7. Estimated quantity and disposition of recovered material that resulted from the incident.

The emergency coordinator will also note in the operating record the time, date and details of any incident that requires implementation of the contingency plan.

## FIGURE G-5

REPORTING FORM FOR EMERGENCY EVENTS

Name of Facility: \_\_\_\_\_

Address of Facility: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name and Address of  
Operator: \_\_\_\_\_

(Name)

\_\_\_\_\_

(Street)

\_\_\_\_\_

(City)

(State)

(Zip Code)

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Type of Incident: \_\_\_\_\_

Name and Quantity of Materials Involved: \_\_\_\_\_

\_\_\_\_\_

Extent of Injuries: \_\_\_\_\_

\_\_\_\_\_

Assessment of Hazards: \_\_\_\_\_

\_\_\_\_\_

Estimated Quantity and Disposition of Material from the Incident:

\_\_\_\_\_

\_\_\_\_\_

G-9 Amendments [40 CFR 264.540]

G-9a Amendments to the Contingency Plan

The contingency plan will be reviewed and revised by the PROTECO emergency coordinators whenever:

- the facility Part B permit is revised
- in accordance with the experience acquired during each emergency situation
- the plan fails during an emergency situation
- the list of emergency coordinator changes
- the list of emergency equipment changes
- changes in design, construction or operation increases the potential for released, fires or explosions.

G-9b Amendments to the Spill Prevention, Control and Countermeasures Plan (SPCC)

This contingency plan has been prepared in accordance with 40 CFR 264 Subpart D and with Part B of the permit application as required by the Environmental Protection Agency (40 CFR 122). This plan supplements PROTECO's SPCC plan developed in accordance with 40 CFR 112.

## FIGURE G-5

REPORTING FORM FOR EMERGENCY EVENTS

Name of Facility: \_\_\_\_\_

Address of Facility: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Telephone Number: \_\_\_\_\_

Name and Address of  
Operator: \_\_\_\_\_

(Name)

\_\_\_\_\_  
(Street)\_\_\_\_\_  
(City)

(State)

(Zip Code)

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Type of Incident: \_\_\_\_\_

Name and Quantity of Materials Involved: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Extent of Injuries: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Assessment of Hazards: \_\_\_\_\_

\_\_\_\_\_  
Estimated Quantity and Disposition of Material from the Incident:\_\_\_\_\_  
\_\_\_\_\_

Appendix G.1

**PROTECO****Protección Técnica Ecológica**

June 13, 1986

Mr. Conrad Simon, Director  
Air and Waste Management Division  
U S Environmental Protection  
Agency - Regional II  
26 Federal Plaza  
New York, N Y 10278

Re: Hazardous Waste Emergency Coordinators

Dear Mr. Simon:

As required by 40 C F R Parts 265.55 and 264.55, please find below the personnel that is actually and will be in charge of being the emergency coordinators (E C) in the eventuality that an emergency related with hazardous waste at PROTECO arises:

<u>Name</u>	<u>Position</u>	<u>Home address</u>	<u>Home telephone</u>
Juan E. Negrón	Compliance Officer	Road 512 km 6.7 Bo. Collores Juana Díaz PR	not available*
Mayda Amaro	Technical Aid	Villa Delicias St. 3 #A-4 Ponce Puerto Rico	(809)840-9076
Julio Roubert	Security Supervisor	Los Caobos St. 16 #H-74 Ponce, P R	(809)848-5286*

---

\*Can be reached at anytime by means of a two-way hand-held radio

This personnel has been already trained either on-site or in the mainland for attending emergencies related with hazardous waste spills. Training activities will continue in order to improve the personnel capabilities for the implementation of PROTECO contingency plan (addressed in last Part B application submitted to E P A).

**PROTECO**

Protección Técnica Ecológica

The facility Contingency Plan has been already submitted to local authorities for their review and comments. A meeting will be held soon in order to address the responsibilities of the respective authorities about this plan.

Sincerely,

PROTECO CORP.

  
Jorge S. Fernández Pabón  
President

cc: Mr. Carlos Vázquez-Ayala, EQB  
Mr. Gary Brown, F C Hart, Assoc.  
Mr. Pedro A. Marrero, Lebrón Assoc.

rtm

APPENDIX G-2

RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

EMERGENCY COORDINATOR RESPONSIBILITIES

AS DEFINED IN 40 CFR, PART 264, SUBPART D

40 CFR 264.55 Emergency Coordinator

At all times, there must be at least one employee either on the facility premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This emergency coordinator must be thoroughly familiar with all aspects of the facility's contingency plan, all operations and activities at the facility, the location and characteristics of waste handled, the location of all records within the facility and the facility layout. In addition, this person must have the authority to commit the resources needed to carry out the contingency plan.

(Comment: The emergency coordinator's responsibilities are more fully spelled out in Section 265.56. Applicable responsibilities for the emergency coordinator vary, depending on factors such as type and variety of waste(s) handled by the facility, and type and complexity of the facility.)

40 CFR 265.46 Emergency Procedures

- (a) Whenever there is an imminent or actual emergency situation, the emergency coordinator (or his designee when the emergency coordinator is on call) must immediately:
  - (1) Activate internal facility alarms or communication systems, where applicable, to notify all facility personnel; and
  - (2) Notify appropriate State or local agencies with designated response roles if their help is needed.

- (b) Whenever there is a release, fire or explosion, the emergency coordinator must immediately identify the character, exact source, amount and a real extent of any released materials. He may do this by observation or review of facility records or manifests and, if necessary, by chemical analysis.
- (c) Concurrently, the emergency coordinator must assess possible hazards to human health or the environment that may result from the release, fire or explosion. This assessment must consider both direct and indirect effects of the release, fire or explosion (e.g., the effects of any toxic irritating or asphyxiating gases that are generated or the effects of any hazardous surface water run-offs from water or chemical agents used to control fire and heat-included explosions).
- (d) If the emergency coordinator determines that the facility has had a release, fire or explosion which could threaten human health or the environment outside the facility, he must report his findings as follows:
  - (1) If his assessment indicates that evacuation of local areas may be advisable, he must immediately notify appropriate local authorities. He must be available to help appropriate officials decide whether local areas should be evacuated; and
  - (2) He must must immediately notify either the government official designated as the on-scene coordinator for that geographical area (in the applicable regional contingency plan under Part 1510 of this Title) of the National Response Center (using their 24-hour toll-free number, 800/424-8802). The report must include:
    - (i) Name and telephone number of reporter;
    - (ii) Name and address of facility.,
    - (iii) Time and type of incident (e.g., release, fire);

(iv) Name and quantity of material(s) involved, to the extent known;

(v) The extent of injuries, if any; and

(vi) The possible hazards to human health, or the environment, outside the facility.

(e) During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions and releases do not occur, recur or spread to other hazardous waste at the facility. These measures must include, where applicable, stopping processes and operations, collecting and containing released waste and removing or isolating containers.

(f) If the facility stops operations in response to a fire, explosion or release, the emergency coordinator must monitor for leaks, pressure buildups, gas generation or ruptures in valves, pipes or other equipment, wherever this is appropriate.

(g) Immediately after an emergency, the emergency coordinator must provide for treating, storing or disposing of recovered waste, contaminated soil or surface water or any other material that results from a release, fire or explosion at the facility.

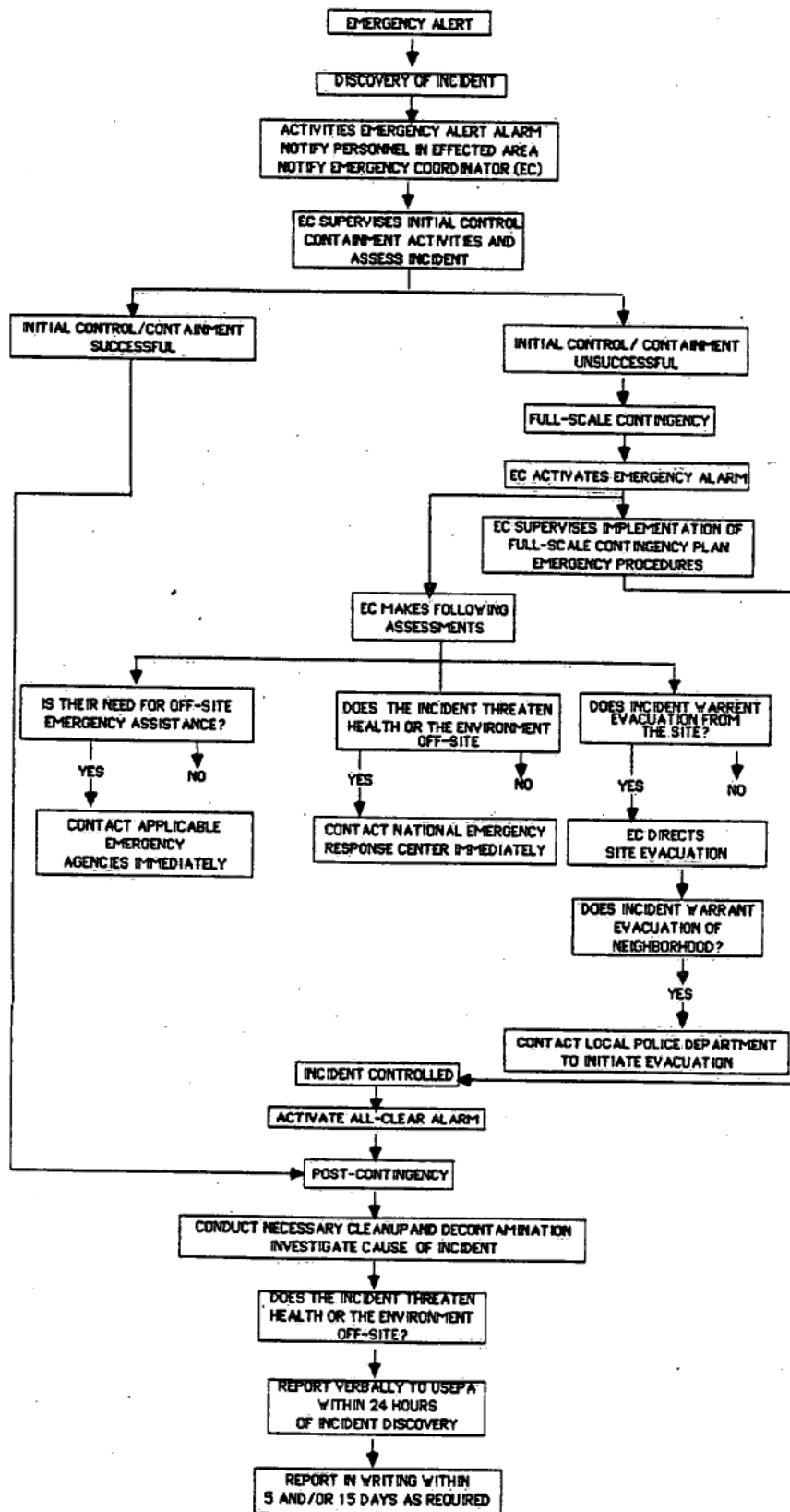
(Comment: Unless the owner or operator can demonstrate, in accordance with Section 261.3(c) or (d) of this Chapter, that the recovered material is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of Parts 262, 263 and 265 of this Chapter.)

(h) The emergency coordinator must ensure that in the affected area(s) of the facility:

- (1) No waste that may be incompatible with the released material is treated, stored or disposed of until cleanup procedures are completed; and
- (2) All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

APPENDIX  
CONTINGENCY IMPLEMENTATION  
Logic Diagram

**CONTINGENCY IMPLEMENTATION  
LOGIC DIAGRAM**



## APPENDIX G.3

PROTECO  
EMERGENCY EQUIPMENT CHECKLIST

Per 40 CFR, Part 264.56(h)(2) the following emergency equipment must be cleaned and fit for its intended use before operation of the facility is resumed.

<u>Item</u>	<u>No.</u>	<u>Functional</u>	<u>Non-Functional</u>	<u>Corrected</u> (initial/date)
<u>Equipment</u>				
Absorbent pads	_____	_____	_____	_____
Fire Extinguishers	_____	_____	_____	_____
Scott Air Packs	_____	_____	_____	_____
Shovels	_____	_____	_____	_____
Hose	_____	_____	_____	_____
Pumps	_____	_____	_____	_____
Backhoe	_____	_____	_____	_____
Front-end Loader	_____	_____	_____	_____
D-6	_____	_____	_____	_____
Vacuum truck	_____	_____	_____	_____
Radio-telephone	_____	_____	_____	_____
Walkie-talkies	_____	_____	_____	_____

APPENDIX G.4

1/2

EMERGENCY EQUIPMENT LOCATIONS

<u>Material/Equipment</u>	<u>Location</u>	<u>Use</u>
Vermiculite	Container Storage Facility	For small spills of oil, acids or caustics, aqueous materials
Speedi-dry	Container Storage Facility	For small spills of oil, non-chlorinated/chlorinated solvents, aqueous materials
Cement kiln dust	In proposed silos. Stabilization/Fixation Facility-	For spills of sludges, solids, toxic materials, lindane waste
Soda ash	Container Storage Facility	For spills of waste acid solutions
Caliche	Borrow areas	To build dikes and for preventing run-off controls
Absorbent pads	Container Storage Facility	Most organics. Do not use for acids.
55-Gallon drums; Steel, polyethylene	Container Storage Facility	Organics, contaminated absorbent materials (steel); acids, caustics, contaminated absorbent materials (polyethylene)
Shovels	Main Facility	Excavation, spill-cleanup
Pump (175 psi, 200 pm)	Stabilization/Fixation Facility	Excavation, spill
Vacuum truck	Maintenance Facility	Spill cleanup
Pickup trucks	Laboratory Facility	Spill cleanup
Front-end loader	Stabilization/Fixation Facility	Excavation, spill cleanup, building emergency dikes
Dump trucks	Stabilization/Fixation Facility	Debris removal, material delivery.

1/2

### EMERGENCY EQUIPMENT LOCATIONS

<u>Material/Equipment</u>	<u>Location</u>	<u>Use</u>
Backhoe	Maintenance Facility	Dig trenches, berms, dikes and cleanup of spilled material
D-6	Landfill Facilities	Dig trenches, berms and dikes compact soil.
1-1/2 inch hose	Maintenance Facility	
Two gallon buckets with handles	Maintenance Facility	For spills of sludges, oils, and adsorbent
Five gallon buckets with handles	Maintenance Facility	For spills of sludges, oils, and adsorbent
Sheets of Plywood 5/8" quartered (2'x 4')	Maintenance Facility	To build dams in culverts, berms
Visqueen	Maintenance Facility	To build dams, keep waste from being adsorbed by the ground
Reinforced Plastic Bags	Container Storage Facility	Temporary storage of soil, absorbents contaminated materials
Scott Air Packs	Container Storage Facility	Protective equipment
Air Tanks	Maintenance Facility	Protective equipment
Hard Hats	Maintenance Facility	Protective equipment
Gloves	Maintenance Facility	Protective equipment
Eyewash Stations	Container Storage Facility, Tank Farm Stabilization/Fixation Facility	Protective equipment
Decontamination Shovers	Container Storage Facility, Tank Farm, Stabilization/Fixation Facility	Protective equipment
Fire Extinguishers	As shown in Figures G.5-1, 2, 3	Fire protection

APPENDIX G.5

### SAMPLING EQUIPMENT FOR VARIOUS TYPES OF WASTE

<u>Waste Type</u>	<u>Sampling Equipment</u>	<u>Additional Information</u>
Ignitable or chlorinated wastes in drums, barrels and similar containers	COLIWASA (glass)	Not for containers greater than 5 ft. deep.
Corrosive wastes in drums, barrels, vacuum trucks and similar containers	COLIWASA (plastic)	Not for containers greater than 5 ft. deep.
Wastes transported by tanker trucks	Weighted bottle sampler	May be difficult to use on very viscous liquids.
Sludges in drums, barrels, dump trucks or similar containers	Trier	Waste should be moist or sticky.
Powdered or granular solids in bags, drums, barrels or similar containers	Thief	Sample particles should be 0.6 cm in diameter or less.
Large grained solids in bags, drums, barrels or similar containers	Large trier	May incur difficulty in retaining core of very dry granular materials.
Wastes received in containers of one (1) gallon or less.	Pipette	Not for containers larger than one gallon. May be difficult to use on viscous materials.

---

#### Source of Information

"Samplers and Sampling Procedures for Hazardous Waste Streams,"  
EPA600/2-80-018.

## SAMPLING POINTS FOR WASTE CONTAINERS

<u>Container Type</u>	<u>Sampling Point</u>
Drum, bung on one end	Withdraw sample through the bung opening.
Drum, bung on side	Lay drum on side with bung up. Withdraw sample through the bung opening.
Barrel, fiberdrum, buckets, sacks, bags	Withdraw samples through the top of barrels, fiberdrums, buckets and similar containers. Withdraw samples through fill openings of bags and sacks. Withdraw samples through the center of the containers and two different points diagonally opposite the point of entry.
Vacuum truck and similar containers	Withdraw sample through open hatch. Sample all other hatches.
Dump truck	Withdraw samples through at least three different points near the top of pile to 2 points diagonally opposite each other.
Tank trucks	Sample from the top through the sampling hatch. With- draw sample from top, middle and bottom of tank.

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### \* Source of Information

"Samplers and Sampling Procedures for Hazardous Waste Streams", EPA-600/2-80-018.

## METHODS USED TO SAMPLE HAZARDOUS WASTES

<u>Sampling Method</u>	<u>Description of Sampling</u>
<u>Sampling a Drum</u>	
<ol style="list-style-type: none"><li>1. Position drum so bung is up.</li><li>2. Allow contents of drum to settle.</li><li>3. Slowly loosen the bung with a bung wrench.</li><li>4. Allow gas pressure to be released.</li><li>5. Remove bung and collect sample with Coliwasas through bung hole.</li></ol>	Prepare a representative composite sample using the Coliwasas sampler by taking three (3) grab samples from bottom, middle and top of the drum.
<u>Sampling a Vacuum Truck</u>	
<ol style="list-style-type: none"><li>1. Open the tank hatch.</li><li>2. Collect a sample with a Coliwasas.</li><li>3. When necessary, take a sediment sample.</li></ol>	Prepare a set of samples collected from the liquid sample and the sediment sample taken from the vacuum truck.
<u>Sampling a Tanker or Storage Tank</u>	
<ol style="list-style-type: none"><li>1. Open the tank hatch.</li><li>2. Collect samples from the tanker with a weighted bottle sampler.</li></ol>	Prepare three separate samples using the weighted bottle sampler by taking three (3) grab samples from bottom, middle and top of the tanker.
<u>Sampling a Barrel, Fiberdrum, or Bags</u>	
<ol style="list-style-type: none"><li>1. Position the container in an up-right position.</li><li>2. Open the container slowly.</li><li>3. Collect a composite sample using either a sampling thief or trier depending on waste consistency.</li></ol>	Prepare a representative composite sample from three (3) grab samples from bottom, middle and top of container using either the thief or trier.
<u>Sampling a Dump Truck</u>	
<ol style="list-style-type: none"><li>1. Determine waste consistency.</li><li>2. Determine the sampling points and angles (front, middle and back of truck).</li><li>3. Collect samples using sampling trier</li></ol>	Prepare a representative composite sample by withdrawing samples through the three different points near the top of the pile and two points diagonally opposite each other.

\*Source of Information:

"Samplers and Sampling Procedures for Hazardous Waste Streams", EPA600/2-80-018

SAMPLE CONTAINERS USED FOR VARIOUS TYPES OF WASTE

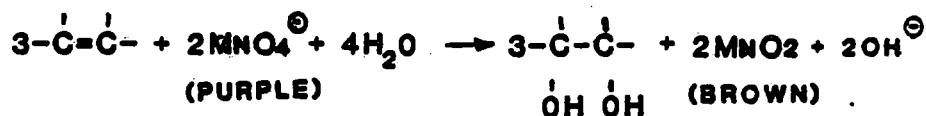
<u>Waste Type</u>	<u>Example of waste</u>	<u>Sample Container</u>
Oil waste	Hydraulic oil	1 Qt. glass
Halogenated organics	Methylene chloride	1 Qt. glass or amber glass
Non-halogenated organics	Toluene	1 Qt. glass
Phenolic wastes	Phenol	1 Qt. glass
Photosensitive wastes	Tetrahydrofuran	1 Qt. amber glass
Metal bearing wastes	Electroplating sludges	1 Qt. polyethylene
Acidic wastes	Sulfuric acid	1 Qt. polyethelene
Alkaline wastes	Sodium hydroxide	1 Qt. polyethylene
Pesticide wastes	Lindane solution	1 Qt. glass
Ignitable wastes	Acetone	1 Qt. glass



## BAEYER TEST

### Aqueous Potassium Permanganate

An alkene or an alkyne is oxidized by potassium permanganate. The characteristic color of the permanganate ion disappears as it is consumed and this serves as an indication that a reaction has taken place.



A solution of 0.5 milliliter (ml) of liquid to be tested or 0.1 gram (g) of a solid to be tested, dissolved in 1 ml of ethanol or acetone, is placed in a test tube. A 2 percent potassium permanganate solution is added dropwise, and the test tube shaken after each addition. A positive test is indicated by the rapid decolorization of the permanganate solution. If a solvent is used, it is advisable to run a blank by adding the permanganate solution to 1 ml of the solvent.

Other substances that also are easily oxidized give a positive Baeyer test. Aldehydes, some alcohols, and certain polyfunctional compounds respond. Therefore, a positive Baeyer test merely indicates the presence of an easily oxidizable group.

## HALIDE TEST

When it has been established that the organic compound contains a halogen, the specific structural type can be ascertained by appropriate test. That is, a distinction can be made between primary, secondary, tertiary or allyl or benzyl, and aryl or vinyl halides. The test is based on the reaction of the halide with silver nitrate solution. An alcoholic solution of the reagent is employed so that a homogeneous reaction mixture is obtained.

Aryl and vinyl halides do not react because of the difficulty of displacing the halogen in such systems. The other types of halides do react with silver nitrate and the corresponding insoluble silver halide is formed. The distinction is made from the observed rate of reaction. A tertiary, allyl or benzyl type halide reacts most rapidly, and a precipitate of the silver halide is observed almost instantaneously. A secondary aliphatic halide reacts more slowly, and the precipitate does not appear until after the elapse of one to five minutes. A primary halide reacts very slowly, and the reaction mixture must be heated in order for the silver halide to precipitate out.

A drop or a few milligrams of the test compound is added to 2 ml of a 2 percent solution of silver nitrate in methanol or ethanol. If no precipitate is formed immediately, the solution is heated to boiling in a hot water bath. The absence of a precipitate after this last treatment indicates an unreactive halide.

The interpretation of the results of this test must be done carefully. For example, an aryl halide having one or more meta-directing groups ortho or para to the halogen may also react with silver nitrate solution. Thus, if it is later determined that a nitro group, for instance, is present in an aromatic compound that also contains reactive halogen, it is quite possible that the substance is an ortho or para substituted nitroaryl halide. Furthermore, a compound may contain two halogen atoms per molecule, one of which is tertiary and the other, primary. The rapid reaction of the tertiary halide will obscure the presence of the primary halide function.



AMERICAN NATIONAL  
STANDARD

ASTM D 891 - 59 (Reapproved 1976)<sup>1</sup>

## Standard Test Methods for SPECIFIC GRAVITY OF INDUSTRIAL AROMATIC HYDROCARBONS AND RELATED MATERIALS<sup>1</sup>

This Standard is issued under the fixed designation D 891; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

*These methods have been approved for use by agencies of the Department of Defense to replace Method 4183 of Federal Test Method Standard No. 141A and for listing in the DoD Index of Specifications and Standards.*

*This method has been replaced by Committee D-16 in favor of Method D 3505 and will be withdrawn from Part 29 in April 1981. Also, this method is now under the jurisdiction of Committee E-15 and will appear in Part 30.*

NOTE: Editorial changes were made throughout in October 1976.

### 1. Scope

1.1 These methods<sup>2</sup> cover the determination of the specific gravity (Note 1) of industrial aromatic hydrocarbons and related materials. They define suitable apparatus and procedures and furnish details underlying the interpretation of test data and the selection of numerical limits for agreement among interested persons and agencies.

NOTE—As defined in 2.1.

1.2 Four methods are covered as follows:

1.2.1 *Method A*, specific gravity by means of a specific gravity balance.

1.2.2 *Method B*, specific gravity by means of a hydrometer.

1.2.3 *Method C*, specific gravity by means of a pycnometer.

1.2.4 *Method D*, specific gravity by means of a vacuum pycnometer.

NOTE 3—In rare problems, the pycnometer method (Method C) shall be used.

### 2. Definitions<sup>3</sup>

2.1 *specific gravity*—the ratio of the weight in air of a given volume of the material at a stated temperature to the weight in air of an equal volume of distilled water at a stated temperature. It shall be stated as follows:

2.1.1 When the temperatures of the material and of the water are the same:

Specific gravity,  $x/x$

where  $x$  is the temperature of the material and the water.

2.1.2 When the temperature of the material and of the water are *not the same*:

Specific gravity,  $x/y$

where  $x$  is the temperature of the material and  $y$  is the temperature of the water.

2.2 *absolute specific gravity*—the ratio of the weight referred to vacuum of a given volume of the material at a stated temperature to the weight referred to vacuum of an equal volume of gas-free distilled water (Note

<sup>1</sup> These methods are under the jurisdiction of ASTM Committee E-15 on Industrial Chemicals and is the direct responsibility of Subcommittee E15.23 on Physical Properties.

Current edition accepted Sept. 10, 1959. Originally issued 1946. Replaces D 891 - 51.

<sup>2</sup> For information concerning the development of these methods, see the following references:

ASTM Definitions D 16, Terms Relating to Paint, Varnish, Lacquer, and Related Products, which appears in the *Annual Book of ASTM Standards*, Part 29; ASTM Method D 287, Test for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method), see *Annual Book of ASTM Standards*, Part 23; ASTM Definitions E 12, Terms Relating to Density and Specific Gravity of Solids, Liquids, and Gases, see *Annual Book of ASTM Standards*, Parts 14 and 41.

"Testing of Hydrometers," *Circular No. 16*, Nat. Bureau Standards. "Standard Density and Volumetric Tables," *Circular No. 19*, NBSA, Nat. Bureau Standards.

"Methods of the Chemists of the U.S. Steel Corp. for the Sampling and Analysis of Coal, Coke, and By-Products," Carnegie Steel Co., Bureau of Technical Instruction, Pittsburgh, Pa., 1929.

Griffin, R. C., *Technical Methods of Analysis*, McGraw-Hill Book Co., Inc., New York, N. Y., 1921.

<sup>3</sup> These definitions are in compliance with Definitions E 12.



4) at a stated temperature. It shall be stated as follows:

2.2.1 When the temperatures of the material and of the water are the same:

Absolute specific gravity,  $x/x$  C

where  $x$  is the temperature of the material and the water.

2.2.2 When the temperatures of the material and of the water are not the same:

Absolute specific gravity,  $x/y$  C

where  $x$  is the temperature of the material and  $y$  is the temperature of the water.

NOTE 4—Gas-free distilled water is distilled water which has been boiled to eliminate dissolved gases.

### 3. Test Temperatures

3.1 Material specifications often specify different temperatures at which specific gravity shall be measured (Note 5), for example:

Specific gravity at 15.56/15.56 C.  
Specific gravity at 20/20 C.  
Specific gravity at 25/25 C. or  
Specific gravity at 60/60 F

Where precision is desired, it is necessary to determine the specific gravity at the temperature prescribed in the specifications for the material to be tested and to use instruments that have been calibrated and standardized at the specified temperature.

NOTE 5—For the significance and interpretation of expressions such as "specific gravity at 25/15.56 C" see 14.2.

3.2 For some of the liquids, an agreement may be reached as to the coefficient of expansion of the product. In such cases the specific gravity may be changed from one temperature basis to another as described in 14.3.

### METHOD A—SPECIFIC GRAVITY BY MEANS OF A SPECIFIC GRAVITY BALANCE

#### 4. Apparatus

4.1 **Balance**—Westphal or equivalent balance, capable of determining specific gravity to the fourth decimal place, and equipped with a plummet for use at 15.56 C.

4.2 **Cylinder**—The cylinder may be of metal or of clear glass, with a lip on the rim

for convenience in pouring. A convenient size of cylinder is approximately 1½ in. (38.1 mm) in diameter and 5 in. (127 mm) in height.

4.3 **Thermometer**—An ASTM Gravity Thermometer having a range from -20 to +102 C and conforming to the requirements for Thermometer 12C as prescribed in ASTM Specifications E 1, for ASTM Thermometers.<sup>1</sup>

4.4 **Water Bath**—A water bath capable of maintaining a temperature of 15.56 ± 0.05 C during the test.

#### 5. Procedure

5.1 Cool the sample in the original closed container to the temperature specified for the test. The thermometer, plummet, and cylinder should be at about the same temperature. Take care to prevent the temperature of the sample from changing appreciably during the time necessary to complete the test. This may be done by placing the test cylinder in the water bath maintained at the necessary temperature during the time of the test. Sufficient time shall be allowed to permit the plummet, cylinder, and thermometer to reach the specified temperature. In cases of dispute it is recommended that the temperature of the sample be determined both before and after the reading is taken.

5.2 Suspend the plummet from the arm of the balance and adjust the balance to equilibrium in air so that the reading is zero. Pour freshly boiled and cooled distilled water into the cylinder. Place the cylinder in the water bath and arrange so that the plummet is immersed in the distilled water. Be sure that the plummet is free of air bubbles, is completely submerged, and does not touch the sides or bottom of the cylinder containing the sample. Stir the contents of the cylinder and, when the temperature is 15.56 ± 0.05 C, take the balance reading. Wash the plummet and cylinder with alcohol and ether to clean and dry. Pour enough of the previously cooled sample into the cylinder to cause the suspension wire to be immersed to the same point as before and repeat the above procedure to ob-

<sup>1</sup> Annual Book of ASTM Standards, Part 25.

<sup>2</sup> Annual Book of ASTM Standards, Part 44.

tain the reading when the plummet is immersed in the sample at 15.56 C.

## 6. Calculation

6.1 Calculate the specific gravity as follows:

$$\text{Specific gravity at 15.56/15.56 C} = A/B$$

where:

A = reading obtained with sample, and  
B = reading obtained with water.

## METHOD B—SPECIFIC GRAVITY BY MEANS OF A HYDROMETER

### 7. Apparatus

7.1 *Hydrometer*—The hydrometers to be used shall be those specified in ASTM Specification E 100, for ASTM Hydrometers,<sup>4,5</sup> as follows:

Nominal Specific Gravity Range	Hydrometer
0.830 to 0.900	86H
0.900 to 0.950	87H
0.950 to 1.000	88H

NOTE 6—Corresponding hydrometers calibrated with the API scale may be used and the API reading converted to specific gravity with Table J of D 1250, Petroleum Measurement Tables.<sup>6</sup> In case of dispute the 86H, 87H, and 88H hydrometers shall be controlling.

7.2 *Hydrometer Cylinder*—The vessel in which the sample for the gravity test is confined shall be made of clear glass and shall be cylindrical in shape. For convenience in pouring, it may have a lip on the rim. The inside diameter shall be at least 25.4 mm (1.0 in.) greater than the outside diameter of the hydrometer used in it. The height of the cylinder shall be such that after equilibrium has been reached, the lowest point on the hydrometer will be at least 25 mm (1 in.) off the bottom of the cylinder.

7.3 *Thermometer*—See 4.3.

7.4 *Water Bath*—See 4.4.

### 8. Procedure

8.1 Cool the sample in the original container to about 14 C. Rinse each piece of equipment with a portion of the sample and discard the rinse liquid. Pour the sample into the clean hydrometer cylinder without splashing, so as to avoid formation of air bubbles. Remove any air bubbles adhering to the surface by touching them with a piece of clean

filter paper. Select a location that is free from air currents. Place the cylinder vertically in the water bath and let the temperature of the sample reach  $15.56 \pm 0.05$  C as follows: Stir the contents of the cylinder, being careful to avoid formation of air bubbles. When the temperature of the sample is 15.3 C, slowly and carefully lower the hydrometer into the sample to a level two smallest scale divisions below that at which it will float and then release the hydrometer. After it has come to rest and floats freely away from the walls of the cylinder, read the gravity as the point at which the surface of the sample apparently cuts the hydrometer scale. When the temperature is 15.56 C, make this observation by placing the eye slightly below the level of the liquid and slowly raise the eye until the surface of the sample first seen as a distorted ellipse seems to become a straight line cutting the hydrometer scale. Determine the temperature of the sample just before and also, for referee tests, just after reading the hydrometer.

## METHOD C—SPECIFIC GRAVITY BY MEANS OF A PYCNOMETER\*

### 9. Apparatus

9.1 *Pycnometer*—A pycnometer of 25-ml capacity with a ground-glass stopper having a capillary opening, a chamber to provide for expansion up to room temperature, and a cap to prevent evaporation.

9.2 *Water Bath*—A water bath capable of maintaining a temperature of  $15.56 \pm 0.05$  C, or other required temperature, during the test.

9.3 *Thermometer*—An ASTM Low Softening Point Thermometer having a range from -2 to +80 C and conforming to the requirements for Thermometer 15C as prescribed in Specifications E 1.

9.4 *Analytical Balance*—A balance having a sensitivity of between 2 and 3 scale divisions displacement effected by an excess weight of 1 mg when carrying a load of between 15 and 50 g in each pan.

\* For a high degree of accuracy, the following paper discusses an apparatus and method of much merit:

Lipkin and Associates, "Pycnometer for Volatile Liquids," *Industrial and Engineering Chemistry, Analytical Edition*, Vol. 36, Jan. 15, 1944, pp. 55-58.

The Bingham and other pycnometers employing capillary tubing use the same principle as described in the paper.

9.5 *Analytical Weights*—Class S weights, as certified by the National Bureau of Standards, or equivalent weights.

## 10. Procedure

10.1 Clean the pycnometer by filling it with a saturated solution of chromic acid in sulfuric acid ( $\text{H}_2\text{SO}_4$ , sp gr 1.84), allowing it to stand for a few hours, emptying, and rinsing well with distilled water. Fill the pycnometer with freshly boiled distilled water which has been cooled to 12 to 14 C. Place it in the water bath maintained at  $15.56 \pm 0.05$  C until the pycnometer and its contents are at a constant volume at 15.56 C. After immersion in the bath for at least 30 min, adjust the level of liquid to the proper point on the pycnometer, put the stopper in place, remove from the bath, wipe dry, and weigh. Empty the pycnometer, rinse successively with alcohol and ether, remove the ether vapor, immerse in the bath, and bring to 15.56 C as was done before. After immersion at 15.56 C for at least 30 min, put the stopper in place, remove from the bath, wipe dry, and weigh. Subtract the weight of the empty pycnometer from the weight when filled with water in order to get the weight of the contained water at 15.56 C in air. Call this difference  $W$ . Cool the sample to 12 to 14 C, fill the pycnometer with it, immerse in the bath and bring to 15.56 C as was done before. After immersion at 15.56 C for at least 30 min, adjust the liquid level, put the stopper in place, remove from the bath, wipe dry, and weigh. Subtract the weight of the empty pycnometer from the weight when filled with sample in order to obtain the weight of the contained sample at 15.56 C. Call this difference  $S$ .

## 11. Calculation

11.1 Calculate the specific gravity at 15.56/15.56 C (in air) as follows:

$$\text{Specific gravity at 15.56/15.56 C} = S/W$$

### METHOD D—SPECIFIC GRAVITY BY MEANS OF A VACUUM PYCNOMETER

NOTE 7—This method is suitable for use where an agreement has been reached concerning the magnitude of the coefficient of cubical expansion of the material at different temperatures.

## 12. Apparatus

12.1 *Pycnometer*—A vacuum-wall pycnom-

eter, 25 ml in capacity.

12.2 *Thermometer*—See 9.3.

12.3 *Analytical Balance*—See 9.4.

12.4 *Analytical Weights*—See 9.5.

## 13. Procedure

13.1 Using the procedure described in 13.2, determine at two different temperatures (for example, 15 and 30 C) the weights of water required to fill the pycnometer at these temperatures. Retain the data for use in calculating the weight of water required to fill the pycnometer at any particular temperature at which it is subsequently employed, as outlined in 13.2. Call this calculated weight  $W$ . Dry the pycnometer and keep it ready for use.

13.2 Transfer about 200 ml of the sample at room temperature to a clean, dry 300-ml beaker. Rinse the pycnometer with some of the sample, immerse it in the beaker, and allow it to fill. Insert the thermometer in the beaker. Let the apparatus stand several minutes to permit the sample and the instruments to reach the same temperature. Empty the pycnometer and immerse it again until it is filled with the sample. Record the temperature in degrees Celsius ( $x$ ). Remove the pycnometer, insert the capillary tube stopper, and quickly wipe dry, taking care to see that the ground-glass cap joint is dried and that none of the liquid is removed from the capillary. Put the glass cap in place and weigh at once. Clean and dry the pycnometer and obtain its weight when empty. Record the weight  $W'$  of the sample required to fill the pycnometer at  $x$  degrees Celsius.

## 14. Calculation

14.1 Calculate the specific gravity as follows:

$$S_x = W'/W$$

$$S_o = S_x[1 + k(x - 15.56)](d_x/d_{15.56})$$

where:

$S_x$  = specific gravity at  $x/x$  C.

$S_o$  = specific gravity at 15.56/15.56 C.

$W$  and  $W'$  have the values stated in 13.1 and 13.2 respectively.

$x$  = temperature at which test was made.  
 $k$  = coefficient of cubical expansion (0.00124 for industrial pure benzene and 0.00110 for industrial pure toluene).

- $d_x$  = absolute density of water at  $x$  degrees Celsius, and  
 $d_{15.56}$  = absolute density of water at 15.56 C (taken as 0.99901).

14.2 The expression "specific gravity at 25.0/15.56 C," for example, means the ratio of the weight in air of a given volume of material at 25.0 C to the weight in air of an equal volume of pure water at 15.56 C. This cannot be determined directly due to the fact that the volume of the pycnometer is not the same at 25 C as at 15.56 C. A simple and accurate procedure for obtaining the specific gravity of a sample at  $x/15.56$  C consists in determining the weight in air of that amount of sample which fills the pycnometer at temperature  $x$  C, dividing this by  $W$  (the water weight in air at the same temperature  $x$  C) and correcting for the change in the water weight between  $x$  C and 15.56 C. The water weight in the pycnometer at  $x$  C is derived as follows from the data obtained in 14.1: Divide the observed water weights (in air) at each of two temperatures by the corresponding absolute densities of water and interpolate linearly between these values to find an "apparent volume" of the pycnometer at  $x$  C. This "apparent volume" multiplied by the absolute density of water at  $x$  C gives the value of  $W$ . The specific gravities at  $x/x$  C and at  $x/15.56$  C are inversely proportional to the absolute densities of water at  $x$  C and 15.56 C. Absolute densities of water at different temperatures are tabulated in various handbooks.

14.3 If the coefficient of cubical expansion of the sample is known, its specific gravity,  $S_1$ , at  $x_1/y$  C may be calculated from the

specific gravity,  $S_2$ , at  $x_2/y$  C by using the following equation:

$$S_2 = S_1[1 + k(x_1 - x_2)]$$

where  $k$  is the coefficient of cubical expansion over the proper temperature range. This relationship holds provided that the values of  $S_1$  and  $S_2$  are based upon water of the same reference temperature  $y$  C. By differentiation of this equation, it becomes evident that an error of 0.1 C in measuring the temperature of the sample will cause an error in the specific gravity figure approximately equal to the numerical value of the expression,  $0.1 k S_1$ .

14.4 Optionally, one may calibrate the pycnometer directly at the same temperature at which it is used.

## 15. Precision

15.1 When Method A, C, or D is employed, different laboratories using different instruments should be able to obtain results that differ from the mean by not more than 0.0002.

15.2 The limits of precision and accuracy of any method for determining specific gravity depend upon the attention which is given to details of calibration and technique. Consideration, in general, must be given to the problems of keeping a large volume of liquid (sometimes unstirred) at a constant temperature, providing for the effects of humidity or static electricity during weighing of pycnometers, and weighing relatively large loads. When extreme accuracy is desired, instruments certified by the National Bureau of Standards shall be used and the necessary corrections applied.

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Designation: D 2111 - 71 (Reapproved 1978)

## Standard Test Methods for SPECIFIC GRAVITY OF HALOGENATED ORGANIC SOLVENTS AND THEIR ADMIXTURES<sup>1</sup>

This Standard is issued under the fixed designation D 2111; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

These methods have been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.

### 1. Scope

1.1 These methods cover the determination of the specific gravity of halogenated organic solvents and solvent admixtures. They define suitable apparatus and procedures and furnish details underlying the interpretation of test data and the selection of numerical limits for agreement among interested persons and agencies.

1.2 Four methods are covered as follows:

1.2.1 *Method A*, specific gravity by means of a specific gravity balance.

1.2.2 *Method B*, specific gravity by means of a hydrometer.

1.2.3 *Method C*, specific gravity by means of a pycnometer.

1.2.4 *Method D*, specific gravity by means of a vacuum pycnometer.

NOTE 1—In referee problems, Methods A, C, or D may be used.

### 2. Definitions

2.1 *specific gravity*—the ratio of the weight in air of a given volume of the material at a stated temperature to the weight in air of an equal volume of distilled water at a stated temperature. It shall be stated thus:

2.1.1 When the temperatures of the material and of the water are the same:

Specific gravity  $x/x$  C....

where  $x$  = temperature of the material and the water.

2.1.2 When the temperature of the material and of the water are not the same:

Specific gravity  $x/y$  C....

where:

$x$  = temperature of the material, and  
 $y$  = temperature of the water.

2.1.3 *specific gravity, absolute*—the ratio of the weight referred to vacuum of a given volume of the material at a stated temperature to the weight referred to vacuum of an equal volume of gas-free distilled water (Note 2) at a stated temperature. It shall be stated as in 2.1.

NOTE 2—Gas-free distilled water is distilled water that has been boiled to eliminate dissolved gases.

### 3. Test Temperatures

3.1 Material specifications often specify different temperatures at which specific gravity shall be measured:

Specific gravity 15/4 C  
Specific gravity 20/20 C  
Specific gravity 25/25 C

For purposes of unity, the test temperature used throughout shall be 25/25 C.

3.2 For some of the liquids, an agreement may be reached as to the coefficient of expansion of the product. In such cases, the specific gravity may be changed from one temperature basis to another as described in Section 14.

### METHOD A—SPECIFIC GRAVITY BY MEANS OF A SPECIFIC GRAVITY BALANCE

#### 4. Apparatus

4.1 *Balance*—Westphal or equivalent, capable of determining specific gravity to the

<sup>1</sup> These methods are under the jurisdiction of ASTM Committee D-26 on Halogenated Organic Solvents. Current edition effective April 15, 1971. Originally issued 1962. Replaces D 2111 - 64.



fourth decimal place, and equipped with a plummet for use at 25 C.

**4.2 Cylinder**—The cylinder may be of metal or of clear glass, with a lip on the rim for convenience in pouring. A convenient size of cylinder is approximately 1½ in. (38 mm) in diameter and 5 in. (127 mm) in height.

**4.3 Thermometer**—An ASTM Gravity Thermometer having a range from -20 to +102 C and conforming to the requirements for Thermometer 12C as prescribed in ASTM Specification E 1.<sup>2</sup>

**4.4 Water Bath**, capable of maintaining a temperature of 25.0 ± 0.5 C during the test.

## 5. Procedure

**5.1** Cool the sample in the original closed container to the temperature specified for the test. The thermometer, plummet, and cylinder should be at about the same temperature. Take care to prevent the temperature of the sample from changing appreciably during the time necessary to complete the test. This may be done by placing the test cylinder in the water bath maintained at the necessary temperature during the time of the test. Allow sufficient time to permit the plummet, cylinder, and thermometer to reach the specified temperature. In cases of dispute, it is recommended that the temperature of the sample be determined both before and after the reading is taken.

**5.2** Suspend the plummet from the arm of the balance and adjust the balance to equilibrium in air so that the reading is zero. Pour freshly boiled and cooled distilled water into the cylinder. Place the cylinder in the water bath and arrange so that the plummet is immersed in the distilled water. Be sure that the plummet is free of air bubbles, is completely submerged, and does not touch the sides or bottom of the cylinder containing the sample. Stir the contents of the cylinder and, when the temperature is 25.0 ± 0.5 C, take the balance reading. Wash the plummet and cylinder with alcohol and ether to clean and dry. Pour enough of the previously cooled sample into the cylinder to cause the suspension wire to be immersed to the same point as before, and repeat the above procedure to obtain the reading when the plummet is immersed in the sample at 25 C.

## 6. Calculation

**6.1** Calculate the specific gravity as follows:

$$\text{Specific gravity } 25/25 \text{ C} = A/B$$

where:

*A* = reading obtained with the sample, and

*B* = reading obtained with water.

## METHOD B—SPECIFIC GRAVITY BY MEANS OF A HYDROMETER

## 7. Apparatus

**7.1 Hydrometer**—The hydrometers to be used shall be those specified in ASTM Specification E 100, for ASTM Hydrometers<sup>2</sup> as follows:

Nominal Specific Gravity Range	ASTM Hydrometer No.
0.900 to 0.950	107H
0.950 to 1.000	108H
1.000 to 1.050	125H
1.050 to 1.100	126H
1.100 to 1.150	127H
1.150 to 1.200	128H
1.200 to 1.250	129H
1.250 to 1.300	130H
1.300 to 1.350	131H
1.350 to 1.400	132H
1.400 to 1.450	133H
1.450 to 1.500	134H
1.500 to 1.550	135H
1.550 to 1.600	136H
1.600 to 1.650	137H

**7.2 Hydrometer Cylinder**—The vessel in which the sample for the gravity test is confined shall be made of clear glass and shall be cylindrical in shape. For convenience in pouring, it may have a lip on the rim. The inside diameter shall be at least 25.4 mm (1.0 in.) greater than the outside diameter of the hydrometer used in it. The height of the cylinder shall be such that the length of the column of sample it contains is greater by at least 25.4 mm (1.0 in.) than the portion of the hydrometer that is immersed beneath the surface of the sample after a state of equilibrium has been reached.

**7.3 Thermometer**—See 4.3.

**7.4 Water Bath**—See 4.4.

## 8. Procedure

**8.1** Cool the sample in the original container to about 24 C. Rinse each piece of equipment with a portion of the sample. Pour the sample

<sup>2</sup> Annual Book of ASTM Standards, Part 25 and 44.



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into the clean hydrometer cylinder without splashing, so as to avoid formation of air bubbles. Remove any air bubbles adhering to the surface by touching them with a piece of clean filter paper. Select a location that is free of air currents. Place the cylinder vertically in the water bath and let the temperature of the sample reach  $25.0 \pm 0.5$  C as follows: Stir the contents of the cylinder, being careful to avoid formation of air bubbles. When the temperature of the sample is  $24.5$  C, slowly and carefully lower the hydrometer into the sample to a level two smallest scale divisions below that at which it will float and then release the hydrometer. After it has come to rest and floats freely away from the walls of the cylinder, read the gravity as the point at which the surface of the sample apparently cuts the hydrometer scale.

3.2 When the temperature is  $25.0$  C, make this observation by placing the eye slightly below the level of the liquid and slowly raise the eye until the surface of the sample first seen as a distorted ellipse seems to become a straight line cutting the hydrometer scale. Determine the temperature of the sample just before and also, for referee tests, just after reading the hydrometer.

#### METHOD C—SPECIFIC GRAVITY BY MEANS OF A PYCNOMETER

##### 9. Apparatus

9.1 *Pycnometer*, 25-ml capacity with a ground-glass stopper having a capillary opening, a chamber to provide for expansion up to room temperature, and a cap to prevent evaporation.

9.2 *Water Bath*, capable of maintaining a temperature of  $25.0 \pm 0.5$  C, or other required temperature, during the test.

9.3 *Thermometer*—An ASTM Low Softening Point Thermometer having a range from  $-2$  to  $+80$  C and conforming to the requirements for thermometer 15C as prescribed in Specifications E 1.<sup>2</sup>

9.4 *Analytical Balance*, having a sensitivity of between 2 and 3 scale divisions displacement effected by an excess weight of 1 mg when carrying a load of between 15 and 50 g in each pan.

9.5 *Analytical Weights*, Class S, as certified by the National Bureau of Standards, or equiv-

alent weights.

##### 10. Procedure

10.1 Clean the pycnometer by filling it with a saturated solution of chromic acid in concentrated sulfuric acid ( $H_2SO_4$ , sp gr 1.84), allowing it to stand for a few hours, emptying, and rinsing well with distilled water. Fill the pycnometer with freshly boiled distilled water that has been cooled to  $22$  to  $24$  C. Place it in the water bath maintained at  $25.0 \pm 0.5$  C until the pycnometer and its contents are at a constant volume at  $25$  C.

10.2 After immersion in the bath for at least 30 min, adjust the level of liquid to the proper point on the pycnometer, put the stopper in place, remove from the bath, wipe dry, and weigh. Empty the pycnometer, rinse successively with alcohol and ether, remove the ether vapor, immerse in the bath and bring to  $25.0$  C as was done before. After immersion at  $25.0$  C for at least 30 min, put the stopper in place, remove from the bath, wipe dry, and weigh. Subtract the weight of the empty pycnometer from the weight when filled with water in order to get the weight of the contained water at  $25.0$  C in air. Call this difference  $W$ .

10.3 Cool the sample to  $22$  to  $24$  C, fill the pycnometer with it, immerse in the bath, and bring to  $25.0$  C as was done before. After immersion at  $25.0$  C for at least 30 min, adjust the liquid level, put the stopper in place, remove from the bath, wipe dry, and weigh. Subtract the weight of the empty pycnometer from the weight when filled with sample in order to obtain the weight of the contained sample at  $25.0$  C. Call this difference  $S$ .

##### 11. Calculation

11.1 Calculate the specific gravity at  $25/25$  C (in air) as follows:

$$\text{Specific gravity } 25/25 \text{ C} = S/W$$

#### METHOD D—SPECIFIC GRAVITY BY MEANS OF A VACUUM PYCNOMETER

##### 12. Apparatus

12.1 *Pycnometer*—A vacuum-wall pycnometer, 25 ml in capacity.

12.2 *Thermometer*—See 9.3.

12.3 *Analytical Balance*—See 9.4.

12.4 *Analytical Weights*—See 9.5.



### 13. Procedure

13.1 Using the procedure described in 13.2, determine at two different temperatures (for example, 15 and 30 C) the weights of water required to fill the pycnometer at these temperatures. Retain the data for use in calculating the weight of water required to fill the pycnometer at any particular temperature at which it is subsequently employed, as outlined in 14.2. Call this calculated weight  $W$ . Dry the pycnometer and keep it ready for use.

13.2 Transfer about 200 ml of the sample at room temperature to a clean, dry 300-ml beaker. Rinse the pycnometer with some of the sample, immerse it in the beaker, and allow it to fill. Insert the thermometer in the beaker. Let the apparatus stand several minutes to permit the sample and the instruments to reach the same temperature. Empty the pycnometer and immerse it again until it is filled with the sample. Record the temperature in degrees Celsius,  $x$ . Remove the pycnometer, insert the capillary tube stopper, and quickly wipe dry, taking care to see that the ground-glass cap joint is dried and that none of the liquid is removed from the capillary. Put the glass cap in place and weigh at once. Clean and dry the pycnometer and obtain its weight when empty. Record the weight  $W'$  of the sample required to fill the pycnometer at  $x$  C.

### 14. Calculation

14.1 Calculate the specific gravity as follows:

$$S_x = W'/W$$

$$S_x = S_{25} [1 + k(x - 25.0)] (d_w/d_{25,w})$$

where:

$S_x$  = specific gravity  $x/x$  C.

$S_{25}$  = specific gravity 25/25 C.

$W, W'$  = values stated in 13.1 and 13.2, respectively.

$x$  = temperature at which the test was made.

$k$  = coefficient of cubical expansion (0.00117 at 0 to 40 C for trichloroethylene, 0.00102 at 0 to 25 C for perchloroethylene, 0.00125 at 0 to 30 C for 1,1,1-trichloroethane, 0.00137 at 0 to 40 C for methylene chloride, and 0.000927 at 0 to 30 C for fluorocarbon-113)

$d_x$  = absolute density of water at  $x$  C. and

$d_{25}$  = absolute density of water at 25 C (taken as 0.997044).

14.2 Material specifications often specify different temperatures at which specific gravity shall be measured. In order to convert to any selected temperature, the coefficient of cubical expansion of 0.00117 for trichloroethylene and 0.00102 for perchloroethylene are employed. In addition, the absolute density of water at the desired temperature is taken. The absolute densities of water at different temperatures are tabulated in various handbooks. In converting to any desired temperature basis the following equation is used:

$$\text{Specific gravity } T_1/T_2, \text{ C} \\ = \text{specific gravity } T_1/T_2 \\ \frac{[1 + k(T_1 - T_2)] (d_{w,1} \text{ at } T_1)}{d_{w,2} \text{ at } T_2}$$

where:

$T_1/T_2$  = original temperature conditions.

$T_1/T_2$  = new temperature conditions.

$k$  = coefficient of cubical expansion (0.00117 at 0 to 40 C for trichloroethylene, 0.00102 at 0 to 25 C for perchloroethylene, 0.00125 at 0 to 30 C for 1,1,1-trichloroethane, 0.00137 at 0 to 40 C for methylene chloride, and 0.000927 at 0 to 30 C for fluorocarbon-113)

$d_{w,1}$  = absolute density of water at the specified temperature.

NOTE 3: Example—Assume a specific gravity of 1.4550 at 25/25 C for trichloroethylene and this is to be converted to 15/4 C and 20/20 C.

Specific gravity 15/4 C

$$= 1.4550/[1 + 0.00117(15 - 25)] (0.999973/0.997044) \\ = 1.4550/[0.9883] 1.00293 \\ = 1.4679$$

where 0.999973/0.997044 = ratio of the absolute density of water at 4 C compared to the absolute density of water at 25 C.

Specific gravity 20/20 C

$$= 1.4550/[1 + 0.00117(20 - 25)] (0.998203/0.997044) \\ = 1.4550/[0.99415] 1.00116 \\ = 1.4619$$

where 0.998203/0.997044 = ratio of the absolute density of water at 20 C compared to the absolute density of water at 25 C.



NOTE 4—Figures for absolute density of water are taken from the *Handbook of Chemistry and Physics*, Forty-ninth edition (1968-1969), published by The Chemical Rubber Co.

## 15. Precision

15.1 When Method A, C, or D is employed, different laboratories using different instruments should be able to obtain results that differ from the means by not more than 0.0002.

15.2 The limits of precision and accuracy of any method for determining specific grav-

ity depend upon the attention that is given to details of calibration and technique. Consideration, in general, must be given to the problems of keeping a large volume of liquid (sometimes unstirred) at a constant temperature, providing for the effects of humidity or static electricity during weighing of pycnometers, and weighing relatively large loads. When extreme accuracy is desired, instruments certified by the National Bureau of Standards shall be used and the necessary corrections applied.

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*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103, which will schedule a further hearing regarding your comments. Failing satisfaction there, you may appeal to the ASTM Board of Directors.*



## Standard Test Method for WATER USING KARL FISCHER REAGENT<sup>1</sup>

<sup>1</sup> This Standard is issued under the fixed designation E 203; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

<sup>2</sup> This method has been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.

### 1. Scope

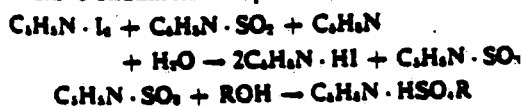
1.1 This method is intended as a general guide for the application of the Karl Fischer reagent method for determining free water and water of hydration in most solid or liquid organic and inorganic compounds. Samples that are gaseous at room temperature are not covered (see Appendix A4). By proper choice of sample size, Karl Fischer reagent concentration, and apparatus, the method is suitable for the measurement of water over a wide concentration range, that is, parts per million to pure water. Both visual and electrometric methods are described for ascertaining the end point.

1.2 A list of existing ASTM Karl Fischer reagent methods, their applications to various products, and the sponsoring committees is given in Appendix A3.

### 2. Summary of Method

2.1 The sample, containing a maximum of 300 mg of water, is dissolved or dispersed in a suitable liquid and titrated with Karl Fischer reagent, which is a mixture of iodine, sulfur dioxide, pyridine, and methanol or glycol ether. As long as any water is present, the iodine is reduced to colorless hydrogen iodide. The end point is the first appearance of free iodine, determined either visually or electrometrically. In some cases it may be desirable to add excess Karl Fischer reagent, and then back-titrate with methanol containing a known concentration of water.

2.2 Fundamental equations are as follows:



NOTE 1: Caution—Karl Fischer reagent contains four toxic compounds, namely, iodine, sulfur dioxide,

pyridine, and methanol or glycol ether. The reagent should be dispensed in a well-ventilated area. Care must be exercised to avoid unnecessary inhalation of the reagent or direct contact of the reagent with the skin. Following accidental spillage, wash with large quantities of water.

### 3. Applications

3.1 Applications can be subdivided into two sections: (1) organic and inorganic compounds in which water may be determined directly, and (2) compounds in which water cannot be determined directly, but in which interferences may be eliminated by suitable chemical reactions or modifications of the procedure. Further discussion of interferences is included in Appendix A2.

3.2 Water can be determined directly in the presence of the following types of compounds:

#### ORGANIC COMPOUNDS

Acetals	Halides
Acids (Note 2)	Hydrocarbons (saturated and unsaturated)
Acyl halides	Ketones, stable
Alcohols	(Note 5)
Aldehydes, stable	Nitriles
(Note 3)	Orthoesters
Amides	Peroxides (hydro, dialkyl)
Amines, weak (Note 4)	Sulfides
Anhydrides	Thiocyanates
Disulfides	Thioesters
Esters	
Ethers	

#### INORGANIC COMPOUNDS

Acids (Note 6)	Cupric oxide
Acid oxides (Note 7)	Desiccants
Aluminum oxides	Hydrazine sulfate
Anhydrides	Salts of organic and inorganic acids (Note 7)
Barium dioxide	
Calcium carbonate	

This method is under the jurisdiction of ASTM Committee E-15 on Industrial Chemicals.  
Current edition approved April 25, 1975. Published June 1975. Originally published as E 203 - 62 T. Last previous edition E 203 - 64 (1971).

NOTE 2—Some acids, such as formic, acetic, and adipic acid, are slowly esterified. For high accuracy, use 30 to 50 percent pyridine in methanol as the solvent.

NOTE 3—Examples of stable aldehydes are formaldehyde, sugars, chloral, etc. Formaldehyde polymers contain water as methylol groups. This combined water is not titrated. Addition of an excess of  $\text{NaOCH}_3$  in methanol permits release and titration of this combined water, after approximate neutralization of excess base with acetic acid (see Note 10).

NOTE 4—Weak amines are considered to be those with  $K_b$  value  $< 2.4 \times 10^{-3}$ .

NOTE 5—Examples of stable ketones are diisopropyl ketone, camphor, benzophenone, benzil, dibenzolacetone, etc.

NOTE 6—Sulfuric acid up to a concentration of 92 percent may be titrated directly; for higher concentrations see Note 14.

NOTE 7—Compounds subject to oxidation-reduction reactions in an iodine-iodide system interfere.

3.3 A number of substances and classes of compounds interfere in the determination of water by this titrimetric method, complete descriptions of which are found in the literature (1).<sup>1</sup> This interference is associated with condensation or oxidation-reduction reactions.

3.4 Interferences of many classes of compounds can be eliminated by chemical reactions to form inert compounds prior to titration. The following are in this category:

- Aldehydes and ketones, active (Note 8)
- Amines, strong (Note 9)
- Ammonia (Note 10)
- Ferric salts (Note 11)
- Hydrazine derivatives (Note 10)
- Hydroxylamine salts (Note 12)
- Mercaptans (Note 13)
- Sodium methylate (Note 10)
- Sulfuric acid (Note 14)
- Thioacids (Note 13)
- Thioureas (Note 13)

NOTE 8—This interference may be reduced by use of pyridine rather than methanol as solvent for the sample or by the use of Karl Fischer reagent and solvent prepared with ethylene glycol monomethyl ether in place of methanol. The cyanhydrin reaction may be used to eliminate the interference (1).

NOTE 9—Strong amines are considered to be those with  $K_b$  value  $> 2.4 \times 10^{-3}$ . Use salicylic acid-methanol solution (Section 5). Glacial acetic acid is applicable in certain cases.

NOTE 10—Addition of acetic acid eliminates the interference.

NOTE 11—Ferric fluoride does not interfere. Reaction with 8-hydroxyquinoline is reported to eliminate this interference (7).

NOTE 12—Add 1 M  $\text{SO}_2$  in 1+1 pyridine-methanol or spent Karl Fischer reagent.

NOTE 13—Olefin addition reaction eliminates

interferences (1). Oxidation with neutral iodine solution eliminates the interference of mercaptans (8).

NOTE 14—Sulfuric acid, above 92 percent. Add the sample (10 g) to a large excess of pyridine (35 ml), swirl to dissolve precipitate, and titrate. Addition of 8 ml of 1+1 pyridine-dioxane/1 g of sample also is satisfactory, maintaining a homogeneous solution throughout the titration.

3.5 Many materials react stoichiometrically with Karl Fischer reagent. When their concentration is known, suitable corrections can be applied. A list of such materials is given in Appendix A2.

#### 4. Apparatus

4.1 A suggested assembly of the apparatus, to provide a closed system during titration, is shown in Appendix A1, Fig. A1.

4.2 This equipment, without the end point detector, may be used for visual titration.

#### 5. Reagents

5.1 Reagent grade chemicals or equivalent as specified in ASTM Methods E 200, Preparation, Standardization and Storage of Standard Solutions for Chemical Analysis,<sup>2</sup> shall be used in all tests.

5.2 Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to ASTM Specification D 1193, for Reagent Water.<sup>3</sup>

5.3 *Karl Fischer Reagent*—The Karl Fischer reagent may either be prepared in the laboratory or purchased. Two types of reagent are commonly used. Directions for preparing these (Caution, see Note 15) and diluting if necessary, along with commercial sources of supply, are as follows:

NOTE 15: Caution—Follow standard precautions for handling toxic gases in preparing reagents (1) or (2) below.

5.3.1 *Karl Fischer Reagent (Ethylene Glycol Monomethyl Ether Solution, 1 ml = 6 mg  $\text{H}_2\text{O}$ )* (2)—For each liter of solution, dissolve  $133 \pm 1$  g of iodine in  $425 \pm 5$  ml of pyridine in a dry glassstoppered bottle. Add  $425 \pm 5$  ml of ethylene glycol monomethyl ether. Cool to below 4 C in an ice bath. Bubble 102 to 105 g of gaseous sulfur dioxide ( $\text{SO}_2$ ) into the cooled mixture. Determine the amount of

<sup>1</sup> The boldface numbers in parentheses refer to the list of references appended at the end of this method.

<sup>2</sup> Annual Book of ASTM Standards, Parts 30 and 41.

<sup>3</sup> Annual Book of ASTM Standards, Part 31.



SO<sub>2</sub> added by the change in weight of the SO<sub>2</sub> cylinder or the increase in volume (about 70 ml) of the reagent mixture. Alternatively, add about 70 ml of freshly drawn liquid SO<sub>2</sub> in small increments. Mix well and set aside for at least 12 h before using.

**5.3.2 Karl Fischer Reagent (Methanol Solution, 1 ml = 6 mg H<sub>2</sub>O)**—For each liter of solution, dissolve 133 ± 1 g of iodine in 425 ± 5 ml of pyridine in a dry, glass-stoppered bottle. Add 425 ± 5 ml of methanol. Cool the mixture in an ice bath to below 4 C. Bubble 102 to 105 g of gaseous sulfur dioxide (SO<sub>2</sub>) into the cooled mixture. Determine the amount of SO<sub>2</sub> added by the change in weight of the SO<sub>2</sub> cylinder or the increase in volume (about 70 ml) of the reagent mixture. Alternatively, add about 70 ml of freshly drawn liquid SO<sub>2</sub> in small increments. Mix well and set aside for at least 12 h before using.

**5.3.3 Karl Fischer Reagent (Ethylene Glycol Monomethyl Ether Solution, stabilized, 1 ml = 6 mg H<sub>2</sub>O).**<sup>9</sup>

**5.3.4 Karl Fischer Reagent (Methanol Solution, Stabilized, 1 ml = 5 mg H<sub>2</sub>O).**<sup>9</sup>

**5.3.5 Karl Fischer Reagent, Dilute**—Prepare more dilute solutions of the Karl Fischer reagent by diluting with the proper solvent as follows:

Desired Strength mg H <sub>2</sub> O/ml	Liters of Diluent to Add/liter of 6 mg/ml KF Reagent
3	0.85
2	1.6
1	3.2
0.5	5.7

These dilute solutions cannot be prepared by simple proportion, since water added with the diluent must be accounted for. The volumes to add, indicated above, are calculated assuming the diluent contains 0.05 percent water.

**5.4 Methanol Standard (1 ml = 1 mg H<sub>2</sub>O)**<sup>9</sup>—This solution can be stored conveniently in a bottle with rubber cap and portions removed with a hypodermic syringe.

**5.5 Sodium Tartrate Dihydrate**—Grind certified material (water content 15.61 to 15.71 percent) to a fine powder (preferably overnight in a sealed ball mill) and store the ground material in a stoppered bottle. If doubt exists as to its water content, dry a 2 to 3-g sample in an oven at 155 ± 5 C to con-

stant weight (minimum 4 h). (See Note 16.)

## 5.6 Solvents:

**5.6.1 Acetic Acid, glacial.**

**5.6.2 Ethylene Glycol Monomethyl Ether,** maximum 0.1 percent water.

**5.6.3 Methanol,** maximum 0.15 percent water,<sup>9</sup> in accordance with Specification D 1152, for Methyl Alcohol (Methanol).<sup>9</sup>

**5.6.4 Pyridine,** maximum 0.1 percent water.

**5.7 Solvents, Mixed**—In addition to the single solvents (5.6), the following mixed solvents are useful for dissolving various samples:

**5.7.1 Methanol - Chloroform (1+3)**—Mix 1 volume of methanol with 3 volumes of chloroform. Use for liquid petroleum products.

**5.7.2 Methanol - Salicylic Acid**—Dissolve 150 g of salicylic acid in 1 liter of methanol. Use for amines.

**5.7.3 Pyridine - Ethylene Glycol (1+4)**—Mix 1 volume of pyridine with 4 volumes of ethylene glycol. Use for compounds containing carbonyl groups.

**5.7.4 Pyridine - Methanol (1 + 4)**—Mix 1 volume of pyridine with 4 volumes of methanol. Use for organic acids.

**5.8 Sulfur Dioxide,** anhydrous grade.

## 6. Drying of Solvents

**6.1** If it is necessary to prepare dry solvents in the laboratory, the following three methods can be used:

**6.1.1 Distillation of methanol from magnesium,** to reduce the moisture content to 0.005 percent, according to Section 6 of ASTM Method D 1744, Test for Water in Liquid Petroleum Products by Karl Fischer Reagent.<sup>10</sup>

**6.1.2 Azeotropic distillation using benzene,** to reduce the moisture to 0.05 percent. Add 1 volume of benzene to 19 volumes of pyridine, ethylene glycol monomethyl ether, or mixtures thereof, and distill. Discard the first

<sup>9</sup> Fisher Scientific Co. Catalog No. So-K-3 has been found satisfactory.

<sup>9</sup> Mallinckrodt Catalog No. 5651, has been found satisfactory.

<sup>9</sup> Fisher Scientific Co. Catalog No. So-W-2 and Hartman-Leddon Co. Catalog No. 1849 have been found satisfactory.

<sup>9</sup> Other acceptable grades are Mallinckrodt Catalog No. 3017, maximum 0.01 percent water, or Fisher Scientific Co. Catalog No. A-412, maximum 0.1 percent water.

<sup>9</sup> Annual Book of ASTM Standards, Part 29.

<sup>10</sup> Annual Book of ASTM Standards, Part 24.



5 percent and use the dry residual 95 percent.

6.1.3 **Molecular sieves.** Solvents *other than methanol* may be dried to a moisture content of 0.05 percent by passing upward through a molecular sieve<sup>11</sup> column, using 1 part molecular sieve per 10 parts of solvent.

## 7. End Point Detection

7.1 **Color End Point**—The titration to a visual end point is not as accurate or precise as the electrometric end point, and cannot be used for highly colored samples. It may, however, be adequate for routine determinations of water above 0.1 to 0.2 percent, in a relatively colorless system. The end point is taken during titration when the color changes from yellow to orange-red and persists for at least 30 s.

7.2 **Electrometric End Point**—The titration to an electrometric end point is applicable over the entire range of water content, and can be used for samples that give colored solutions. Usually the electrometric end point is determined by the dead-stop technique (3.9).

7.3 There are several commercial titration assemblies on the market, some of which provide a means for automatically stopping the titration at the end point.<sup>12</sup> Necessary operating instructions are provided with these instruments by the manufacturer; therefore, their use is not described here.

7.4 In this method, use of the simple transistorized end point detector is described in 8.2. The complete assembly is described in Appendix A1.

## 8. Standardization of Karl Fischer Reagent

8.1 Standardize the Karl Fischer reagent daily or as necessary by either the color or electrometric end point, using the amounts of water, sodium tartrate dihydrate, or water-in-methanol shown below:

Water Equivalent, $F$ , mg/ml	Water, g	Sodium Tartrate Dihydrate, g	Water-in-Methanol, Standard, ml
0.5	0.01 to 0.02	0.1 to 0.15	10 to 20
1	0.03 to 0.05	0.2 to 0.3	30 to 50
3	0.09 to 0.15	0.6 to 0.9	
6	0.18 to 0.30	1.1 to 1.9	

8.2 Add 25 or 50 ml of methanol to a clean, dry titration flask containing a stirring bar.

Close the neck of the flask with a two-hole rubber cap. Adjust the magnetic stirrer to give a smooth stirring action. Turn on toggle switch *S2* of the end point detector (see Fig. A2). Set the hi-low toggle switch *S1* to the des red sensitivity. With the electrodes out of the solution or immersed in a wet solution, the meter should read approximately 75 percent of full scale. If the meter reads below 50 percent, the batteries are weak and should be replaced. Titrate with Karl Fischer reagent until a reading of approximately 25 is retained for about 30 s.

8.3 Alternatively, titrate with Karl Fischer reagent to the color end point, 7.1.

8.4 Transfer the selected standard to the pretitrated methanol.

8.4.1 Weigh, to the nearest 0.0001 g, the indicated amount of distilled water from a suitable weighing pipet, hypodermic syringe, or other device, or

8.4.2 Transfer the weighed sodium tartrate dihydrate by means of a dry spatula, dipping the spatula into the alcohol to ensure removal of any adhering tartrate (Note 16), or

8.4.3 Use a hypodermic syringe of suitable capacity to transfer the standard water-in-methanol solution to the titration flask.

NOTE 16—To facilitate transfer of the tartrate to vessels having constricted openings or narrow necks, a spatula with the tip bent at a right angle to the handle is satisfactory. If the tartrate is used for standardizing Karl Fischer reagent for use with samples containing more than 1 percent water, a bias may exist which has been described in Ref. (13).

8.5 Titrate with Karl Fischer reagent to the end point described in 8.2 or 8.3.

8.6 **Calculation**—Calculate the water equivalent,  $F$ , of the Karl Fischer reagent, in milligrams per milliliter, as follows:

**Water as Standard:**

$$F = 1000 G/A$$

**Water-in-Methanol as Standard:**

$$F = DE/A$$

**Sodium Tartrate Dihydrate as Standard:**

<sup>11</sup> Linde Type 4A Molecular Sieve has been found satisfactory for this purpose.

<sup>12</sup> Aquameters, Models KF-2 and KF-3, Beckman Instruments, Inc.; Precision-Dow Recordomatic Titrator, Precision Scientific Co.; Metrohm Potentiograph, Brinkmann Instruments, Inc.; Titrator, transistorized, Karl Fischer Magma-Matic, Arthur H. Thomas Co., have been found satisfactory for this purpose.



$$F = (156.6 \times C)/A$$

where:

- $G$  = grams of water used,
- $C$  = grams of sodium tartrate dihydrate used,
- $A$  = milliliters of reagent required for titration of the standard,
- $D$  = milliliters of water-in-methanol standard required, and
- $E$  = milligrams of water per milliliter in the water-in-methanol standard.

#### 9. Procedure for Soluble Materials, Either Liquid or Solid

9.1 Pipet 25 or 50 ml of the selected sample solvent (Section 5) into the titration flask through the second hole in the rubber cap; see Appendix A1, Section 4.1. Turn on the magnetic stirrer and adjust the speed to give proper stirring. Titrate the water in the solvent with Karl Fischer reagent, as described in 8.2 or 8.3.

9.2 Weigh or pipet a sample of the proper size, usually containing 20 to 300 mg of water, into the flask and titrate again to the same end point.

NOTE 17—The range of water indicated is for macro titrations. Considerably smaller amounts of water can be determined precisely on a micro scale. For example, less than 300  $\mu$ g of water were titrated in 1-ml samples of benzene by a micro amperometric technique (4).

9.3 *Calculation*—Calculate the water content of the sample as follows:

$$\text{Water, percent} = [(AF \times 0.001)/W] \times 100$$

where:

- $A$  = milliliters of reagent required for titration of the sample,
- $F$  = water equivalent, in milligrams of water per milliliter of KF reagent, and
- $W$  = grams of sample.

#### 10. Procedure for Insoluble Solids

10.1 In case the sample is insoluble in the solvent or solvent mixture used, one of two modifications may be applied. The entire sample-solvent slurry may be titrated, or after stirring and standing, an aliquot of the clear supernatant liquid may be withdrawn and titrated. The latter modification is particularly useful for alkaline samples which are relatively insoluble in the solvent used (12).

10.2 Weigh the sample into a clean and dry titration flask, add 25 to 50 ml of the selected solvent (Section 5) and stopper the flask. Extract the water by stirring with a magnetic stirrer for 15 min or longer, or warming if indicated. Titrate the mixture at room temperature with Karl Fischer reagent as described in 8.2 or 8.3 (Note 18). Also titrate the same volume of solvent as a blank.

NOTE 18—If desired, a known excess of Karl Fischer reagent may be added to the flask, allowed to stand, and then back-titrated with standard water-in-methanol reagent, as described in ASTM Methods D 1348, Test for Moisture in Cellulose.<sup>13</sup> In this case, the electrometric end point indication is the reverse of that described in 8.2.

10.3 *Calculation*—Calculate the water content of the sample as follows:

$$\text{Water, percent} = [(A - B)F \times 0.001/W] \times 100$$

where:

- $A$  = milliliters of reagent required to titrate the sample mixture,
- $B$  = milliliters of reagent required to titrate the solvent blank,
- $F$  = water equivalent, in milligrams of water per milliliter of KF reagent, and
- $W$  = grams of sample.

10.4 Alternatively, add 50 to 100 ml of the solvent to the sample in a volumetric flask, stopper, and extract as before. Make up to the mark, mix, and allow to stand until clear. Transfer a suitable aliquot portion of the supernatant liquid to a titration flask, and titrate with Karl Fischer reagent as described in 8.2 or 8.3. Also titrate the same volume of the solvent, as a blank.

10.5 *Calculation*—Calculate the water content of the sample as follows:

$$\text{Water, percent} = [(A - B)F \times 0.001/W] \times 100 \times R$$

- $A$  = milliliters of reagent required to titrate the sample,
- $B$  = milliliters of reagent required to titrate the solvent blank,
- $F$  = water equivalent, in milligrams of water per milliliter of KF reagent,
- $W$  = grams of sample, and
- $R$  = aliquot factor.

#### 11. Precision and Accuracy

11.1 Sensitivity, precision, and accuracy depend on several factors, for example, con-

<sup>13</sup> Annual Book of ASTM Standards, Part 21.



centration of the Karl Fischer reagent, titration technique, apparatus, quantity of water titrated, and nature of material being analyzed.

11.2 The sensitivity is about 0.1 mg of water for visual titrations. Less than 0.02 mg can be measured by electrometric titration.

11.3 The following is an example of the precision attained in an interlaboratory (Note 19) study on two samples of acetone containing 0.1 percent and 0.4 percent water and two samples of methyl ethyl ketone containing 0.05 percent and 0.17 percent water:

11.3.1 *Repeatability*.—Two results (each the average of duplicate determinations) obtained by the same analyst should be considered suspect if they differ by more than 0.013 percent, absolute (95 percent confidence level). Duplicate determinations which agree within 0.008 percent are acceptable for averaging (95 percent confidence level).

11.3.2 *Reproducibility*.—Two results (each the average of duplicate determinations) obtained by analysts in different laboratories should be considered suspect if they differ by more than 0.028 percent, absolute (95 percent confidence level).

NOTE 19.—The interlaboratory study was carried out by ASTM Committee D-1 on Paint, Varnish, Lacquer, and Related Products, Subcommittee V on Solvents, Plasticizers, and Chemical Intermediates. Seven laboratories participated, with a single analyst performing duplicate determinations on each of two days, using two methods on the four samples described above. ASTM Method D 1364 Test for Water in Volatile Solvents (Fischer Reagent Titration Method)<sup>9</sup> was the subject of the test program being compared with each laboratory's own version of a Karl Fischer method. As neither the means nor the variances of the two sets of data proved significantly different, all of the results were pooled to give estimates of the repeatability based on 35 degrees of freedom and reproducibility based on 47 degrees of freedom.

## REFERENCES

- (1) Mitchell, J., Jr., and Smith, D. M., *Aquametry*, Interscience Publishers, Inc. 1948.
- (2) Peters, E. D., and Jungnickel, J. L., "Improvements in Karl Fischer Method for Determination of Water," *Analytical Chemistry*, ANCHA Vol 27, 1955 p. 450.
- (3) Fouik, C. W., and Bawden, A. T., "A New Type of End Point in Electrometric Titration and its Application to Iodimetry," *Journal of the American Chemical Society*, JACSA Vol 48, 1926 p. 2045.
- (4) Bastin, E. L., Siegel, H., and Bullock, A. B., "Microdetermination of Water by Titration with Fischer Reagent," *Analytical Chemistry*, ANCHA Vol 31, 1959 p. 467.
- (5) Jones, A. G., "A Review of Some Developments in the Use of the Karl Fischer Reagent," *Analyst*, Vol 76, 1951 p. 5.
- (6) Mitchell, J., Jr., "Treatise on Analytical Chemistry," Part II, Vol I, 1961 p. 69. Interscience Publishers, Inc.
- (7) Laurens, A. M., "Determination of Water by Karl Fischer Titration in the Presence of Ferric Salts," *Analytical Chemistry*, ANCHA Vol 24, 1952 p. 1456.
- (8) Brickell, W. F., "Determination of Water Vapor in Natural Gas by Direct Chemical Method," *Petroleum Engineer*, PENGA Vol 24 1952 p. 58.
- (9) Freedman, R. W., "Transistorized Dead-Stop End Point Detector," *Analytical Chemistry*, ANCHA Vol 31 1959 p. 1287; see also correction, p. 1686.
- (10) Morton, J. D., and Fuchs, L. K., "Determination of Moisture in Fluorocarbons," presented at a meeting of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers, June 13-15, 1960.
- (11) E. I. du Pont de Nemours & Co., Freon Technical Bulletin B-23, "Moisture Determination in 'Freon' Fluorocarbons by Karl Fischer Titration," June, 1961.
- (12) Gard, L. N., and Butler, R. C., "Determination of Moisture in Sodium Bicarbonate—Karl Fischer Method," *Analytical Chemistry*, ANCHA Vol 26, 1954 p. 1367.
- (13) Bensley, T. H., Ziegler, H. W., Charles, R. L., and King, P., "Critical Evaluation of the Karl Fischer Water Method," *Analytical Chemistry*, ANCHA, Vol 44, 1972, p. 1833.

## APPENDIXES

### A1. SUGGESTED APPARATUS FOR KARL FISCHER METHOD

#### A1.1 Scaze

A1.1.1 Described in this Appendix is a glass apparatus, its assembly, and design of a dual-transistorized end point detector. There are available a number of assemblies of similar design which are equally suitable for storing and dispensing the Karl

Fischer reagent, for containing the sample, and for detecting the end point. See Appendix A3 and References (1,6).

#### A1.2 Titration Assembly

A1.2.1 The storage and dispensing assembly

shall consist of the following parts (see Fig. A1):

A1.2.1.1 *Buret*, automatic, with TFE-fluorocarbon resin plug and automatic zero, reservoir bottle, and connecting tube.<sup>16</sup> Select the size buret and bottle needed. An overhead reservoir<sup>18</sup> with micro buret may also be used.

A1.2.1.2 *Tube*, *Drying*, calcium chloride, one bulb, 200 mm long.

A1.2.1.3 *Bottle*, *Aspirator*, with outlet for tubing connections, 500-ml capacity.

A1.2.1.4 *Stirrer*, *Magnetic*, with stirring bar coated with TFE-fluorocarbon resin.

A1.2.1.5 *Flask*, *Titration*, 250-ml capacity.<sup>16</sup>

A1.2.1.6 *Electrodes*, with connecting cord and plugs.<sup>17</sup>

A1.2.1.7 *Rubber Cap*, 1.5 in. (38 mm) in outside diameter.<sup>18</sup> Punch two holes, 3 to 4 mm in diameter, through the cap.

### A1.3 End Point Detector

A1.3.1 Figure A2 shows the wiring diagram of

a sensitive end point detector and a parts list. This end point detector is a dual-range constant-current type detector. The electrode current is switched to select either 5  $\mu$ A or 100  $\mu$ A. This makes possible Karl Fischer titrations using a weak reagent for low ppm water determinations or the usual titrations using the stronger reagents.

### A1.4 Assembly of Apparatus

A1.4.1 Assemble the apparatus as shown in Fig. A1. Fill the drying tube and aspirator bottle with desiccant.<sup>19</sup> Insert the buret tip through one hole in the rubber cap. Use the other hole for inserting a pipet or hypodermic syringe containing liquid samples. Under humid conditions, keep the second hole plugged except when introducing a sample, or pass a slow stream of dry nitrogen into the flask. Connect the plugs on ends of the leads on the titration flask to the jacks of the end point detector.

## A2. INTERFERING COMPOUNDS THAT REACT STOICHIOMETRICALLY WITH KF REAGENT THEREBY ENABLING FREE WATER TO BE CALCULATED AFTER APPLYING CORRECTION

A2.1 Many interfering substances react stoichiometrically with constituents of the KF reagent. Consequently, when independent analyses can be made for these compounds, suitable corrections can be applied to the apparent water results. Also in many cases moisture can be separated from the interfering substance by extraction with a water-miscible liquid in which the sample is insoluble or by distillation, preferably using a carrier that forms a homogeneous azeotrope, for example, dioxane, ethanol - benzene. Materials in this class are given

in Table A1.

A2.2 Some compounds react only partially with KF reagent when titrated under normal conditions. These include the following:

Methyloxalates <sup>20</sup>	Dichromates
Peroxides, diacyl <sup>21</sup>	Iron oxide
Peracids <sup>21</sup>	Nickel oxide
Quinone	Sodium peroxide
Arsenious oxide	Sodium sulfide
Chromates	

## A3. OTHER ASTM KARL FISCHER REAGENT WATER METHODS

Designation	Sponsoring Committee	Title of Method
D 789	D-20	Specification for Nylon Injection Molding and Extrusion Materials <sup>22</sup>
D 890	D-17	Test for Water in Liquid Naval Stores <sup>23</sup>
D 1123	D-15	Test for Water in Engine Coolant Concentrate by the Iodine Reagent Method <sup>24</sup>
D 1348	D-23	Tests for Moisture in Cellulose <sup>25</sup>
D 1364	D-1	Test for Water in Volatile Solvents (Fischer Reagent Titration Method) <sup>26</sup>
D 1457	D-20	Specification for TFE-Fluorocarbon Resin Molding and Extrusion Materials <sup>27</sup>
D 1533	D-9	Test for Water in Insulating Liquids (Karl Fischer Method) <sup>28</sup>
D 1568	D-12	Sampling and Chemical Analysis of Alkylbenzene Sulfonates <sup>29</sup>
D 1631	D-16	Test for Water in Phenol and Related Materials by the Iodine Reagent Method <sup>30</sup>
D 1638	D-39	Testing Urethane Foam Isocyanate Raw Materials <sup>31</sup>
D 1744	D-8	Test for Water in Liquid Petroleum Products by Karl Fischer Reagent <sup>32</sup>
D 2072	D-1	Test for Water in Fatty Nitrogen Compounds <sup>33</sup>

<sup>16</sup> Kimble Glass Co. Catalog No. 17124F, has been found satisfactory for this purpose.

<sup>17</sup> Kimble Glass Co. Catalog No. 17138F, has been found satisfactory for this purpose.

<sup>18</sup> A. H. Thomas Co. Catalog No. 9682-K-40 titration cell has been found satisfactory for this purpose.

<sup>19</sup> A. H. Thomas Co. Catalog No. 9682-K70 electrode has been found satisfactory for this purpose.

<sup>20</sup> Devol Rubber Co. Catalog No. 270 or E. H. Sargent Co. Catalog No. S-73185, 1.5 in., have been found satisfactory for this purpose.

<sup>21</sup> Indicating-type Drierite has been found satisfactory for this purpose.

<sup>22</sup> Interference of methyloxalates can be eliminated by titration at -40°C (11).

<sup>23</sup> Diacyl peroxides and peracids fairly rapidly oxidize the HI of spent KF reagent. After a short time interval following addition of KF reagent, this reaction may be quantitative (11).

<sup>24</sup> Annual Book of ASTM Standards, Part 36.

<sup>25</sup> Annual Book of ASTM Standards, Part 30.

<sup>26</sup> Annual Book of ASTM Standards, Part 40.

## A4. DETERMINATION OF WATER IN GASES

A4.1 Procedures for determining moisture in gases are described in the literature (1,5,6,10,11).

A4.2 As mentioned in Section 1, this method does not include procedures for samples that are gaseous at room temperature. The safe handling and analysis of gases requires a thorough knowledge of their properties and also the use of special apparatus and techniques. The moisture content may range from 1000 down to 2 to 3 ppm.

A4.3 The manufacturers of gases have developed very precise Karl Fischer procedures for measuring moisture down to a few parts per million (10,11). They should be consulted when need arises. Also, there are available commercial instruments that operate on the dew point, infrared, conductance, electrolysis principle, etc., which are rapid and accurate for determining moisture in gas samples (1,6).

TABLE A1 Materials Reacting Stoichiometrically With KF Reagent

Class or Compound	Moles of Apparent H <sub>2</sub> O per Mole Compound	Do Not React
Ascorbic acid	1	
Hydrazine derivatives	1	Hydrazine sulfate
Mercaptans	0.5	
Silanol, R <sub>3</sub> SiOH	1	
R <sub>2</sub> Si(OH) <sub>2</sub>	2	
Arsenate, RA <sub>3</sub> O <sub>3</sub>	3	
Arsenite, RA <sub>3</sub> O <sub>2</sub>	2	
Boric acid, H <sub>3</sub> BO <sub>3</sub>	3	
HBO <sub>2</sub>	2	
Boric oxide, B <sub>2</sub> O <sub>3</sub>	3	
Bicarbonates	1	
Carbonates	1	Calcium carbonate
Cupric salts	0.5	
Ferric salts	0.5	Ferric fluoride
Metal hydroxides, MOH	1	
M(OH) <sub>2</sub>	2	
Metal oxides, CaO, MgO, ZnO, Ag <sub>2</sub> O, HgO, Cu <sub>2</sub> O, MnO <sub>2</sub> , PbO*, PbO <sub>2</sub> *	1	Aluminum, cupric, barium oxides
Pb <sub>2</sub> O <sub>3</sub>	3	
Pyrosulfites	1	Pyrosulfate
Sodium nitrite*	0.5	
Sulfites	1	Hyposulfite
Stannous salts	1	
Tetraborate	7	
Thiosulfate	0.5	

\* The lead oxides react only partially when dispersed in methanol, probably because of insolubility. In acetic acid solution, however, these oxides react quantitatively.

\* Reaction is fairly slow. Apparently free water can be determined in presence of NaNO<sub>2</sub> by rapid titration with KF reagent.

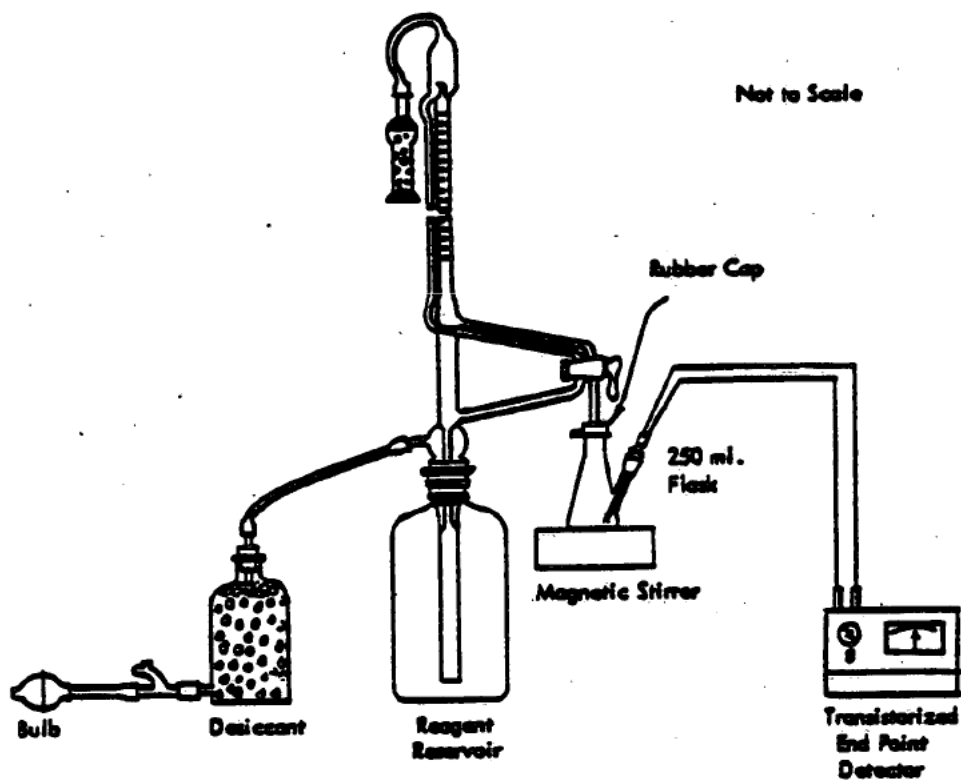
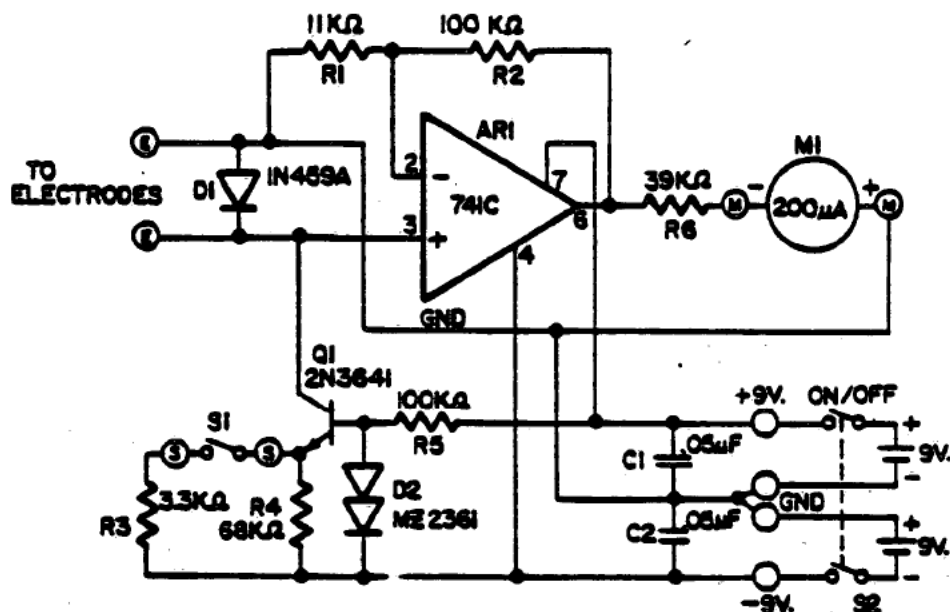


FIG. A1 Karl Fischer Titration Apparatus Assembly.

E 203



# PARTS LIST

## METER SIMPSON MODEL 524

(4 1/2 in.: 0-200 μA)

Amplifier 741C

Diode 1N 459A

Diode MZ 2361

Transistor 2N 3641

Capacitor C1, 0.05 μF

Capacitor C2, 0.05 μF

Resistor R1, 11KΩ, 1/4 W carbon

Resistor R2, 100KΩ, 1/4 W carbon

Resistor R3, 3.3 KΩ, 1/4 W carbon

Resistor R4, 68 KΩ, 1/4 W carbon

Resistor R5, 100 KΩ, 1/4 W carbon

Resistor R6, 39 KΩ, 1/4 W carbon

Switch S1, SPST Toggle

Switch S2, DPST Toggle

2 Battery 9 V.

2 Battery holders

Chassis, aluminum

Connector, Amphenol

Printed circuit board

NOTE—All resistors 1/4-W carbon S1 open for 5 μA. Closed for 100 μA.

FIG. A2. Circuit Diagram of Sensitive End Point Detector.

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# Analytical Methods<sup>1</sup>

## 100 PHYSICAL PROPERTIES

Color	
Colorimetric, ADMI.....	Method 110.1
Colorimetric, Platinum-Cobalt.....	Method 110.2
Spectrophotometric.....	Method 110.3
Conductance	
Specific Conductance.....	Method 120.1
Hardness, Total (mg/l as CaCO <sub>3</sub> )	
Colorimetric, Automated EDTA.....	Method 130.1
Titrimetric, EDTA.....	Method 130.2
Odor	
Threshold Odor (Consistent Series).....	Method 140.1
pH	
Electrometric.....	Method 150.1
Residue	
Filterable	
Gravimetric, Dried at 180°C.....	Method 160.1
Non-Filterable	
Gravimetric, Dried at 103-105°C.....	Method 160.2
Total	
Gravimetric, Dried at 103-105°C.....	Method 160.3
Volatile	
Gravimetric, Ignition at 550°C.....	Method 160.4
Settleable Matter	
Volumetric, Imhoff Cone.....	Method 160.5
Temperature	
Thermometric.....	Method 170.1
Turbidity	
Nephelometric.....	Method 180.1

## 200 METALS

Atomic Absorption Methods.....	Method 200.0
Aluminum	
AA, Direct Aspiration.....	Method 202.1
AA, Furnace.....	Method 202.2

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<sup>1</sup>U.S. EPA, "Methods for Chemical Analysis of Water and Wastes,"  
Environmental Monitoring and Support Laboratory, Cincinnati,  
Ohio, March 1979.

## 200 METALS (Cont.)

### Antimony

- AA, Direct Aspiration.....Method 204.1
- AA, Furnace.....Method 204.2

### Arsenic

- AA, Furnace.....Method 206.2
- AA, Hydride.....Method 206.3
- Spectrophotometric, SDDC.....Method 206.4
- Digestion Method for Hydride and SDDC.....Method 206.5

### Barium

- AA, Direct Aspiration.....Method 208.1
- AA, Furnace.....Method 208.2

### Beryllium

- AA, Direct Aspiration.....Method 210.1
- AA, Furnace.....Method 210.2

### Boron

- Colorimetric, Curcumin.....Method 212.3

### Cadmium

- AA, Direct Aspiration.....Method 213.1
- AA, Furnace.....Method 213.2

### Calcium

- AA, Direct Aspiration.....Method 215.1
- Titrimetric, EDTA.....Method 215.2

### Chromium

- AA, Direct Aspiration.....Method 218.1
- AA, Furnace.....Method 218.2
- Chelation-Extraction.....Method 218.3
- Hexavalent, Chelation-Extraction.....Method 218.4

### Cobalt

- AA, Direct Aspiration.....Method 219.1
- AA, Furnace.....Method 219.2

### Copper

- AA, Direct Aspiration.....Method 220.1
- AA, Furnace.....Method 220.2

200 METALS (Cont.)

Gold	Method 231.1
AA, Direct Aspiration.....	Method 231.2
AA, Furnace.....	
Iridium	Method 235.1
AA, Direct Aspiration.....	Method 235.2
AA, Furnace.....	
Iron	Method 236.1
AA, Direct Aspiration.....	Method 236.2
AA, Furnace.....	
Lead	Method 239.1
AA, Direct Aspiration.....	Method 239.2
AA, Furnace.....	
Magnesium	Method 242.1
AA, Direct Aspiration.....	
Manganese	Method 243.1
AA, Direct Aspiration.....	Method 243.2
AA, Furnace.....	
Mercury	Method 245.1
Cold Vapor, Manual.....	Method 245.2
Cold Vapor, Automated.....	Method 245.5
Cold Vapor, Sediments.....	
Molybdenum	Method 246.1
AA, Direct Aspiration.....	Method 246.2
AA, Furnace.....	
Nickel	Method 249.1
AA, Direct Aspiration.....	Method 249.2
AA, Furnace.....	
Osmium	Method 252.1
AA, Direct Aspiration.....	Method 252.2
AA, Furnace.....	
Palladium	Method 253.1
AA, Direct Aspiration.....	Method 253.2
AA, Furnace.....	

200 METALS (Cont.)

Platinum	Method 255.1
AA, Direct Aspiration.....	Method 255.2
AA, Furnace.....	
Potassium	Method 258.1
AA, Direct Aspiration.....	
Rhenium	Method 264.1
AA, Direct Aspiration.....	Method 264.2
AA, Furnace.....	
Rhodium	Method 265.1
AA, Direct Aspiration.....	Method 265.2
AA, Furnace.....	
Ruthenium	Method 267.1
AA, Direct Aspiration.....	Method 267.2
AA, Furnace.....	
Selenium	Method 270.2
AA, Furnace.....	Method 270.3
AA, Hydride.....	
Silver	Method 272.1
AA, Direct Aspiration.....	Method 272.2
AA, Furnace.....	
Sodium	Method 273.1
AA, Direct Aspiration.....	
Thallium	Method 279.1
AA, Direct Aspiration.....	Method 279.2
AA, Furnace.....	
Tin	Method 282.1
AA, Direct Aspiration.....	Method 282.2
AA, Furnace.....	
Titanium	Method 283.1
AA, Direct Aspiration.....	Method 283.2
AA, Furnace.....	
Vanadium	Method 286.1
AA, Direct Aspiration.....	Method 286.2
AA, Furnace.....	

## 200 METALS (Cont.)

Zinc	Method 289.1
AA, Direct Aspiration.....	Method 289.2
AA, Furnace.....	

## 300 INORGANIC, NON-METALS

Acidity	Method 305.1
Titrimetric.....	

Alkalinity	Method 310.1
Titrimetric (pH 4.5).....	Method 310.2
Colorimetric, Automated Methyl Orange.....	

Bromide	Method 320.1
Titrimetric.....	

Chloride	Method 325.1
Colorimetric, Automated Ferricyanide, AA I.....	Method 325.2
Colorimetric, Automated Ferricyanide, AA II.....	Method 325.3
Titrimetric, Mercuric Nitrate.....	

Chlorine, Total Residual	Method 330.1
Titrimetric, Amperometric.....	Method 330.2
Titrimetric, Back-Iodometric.....	Method 330.3
Titrimetric, Iodometric.....	Method 330.4
Titrimetric, DPD-FAS.....	Method 330.5
Spectrophotometric, DPD.....	

Cyanide	
Amenable to Chlorination	Method 335.1
Titrimetric, Spectrophotometric.....	
Total	Method 335.2
Titrimetric, Spectrophotometric.....	Method 335.3
Colorimetric, Automated UV.....	

Fluoride	
Colorimetric, SPADNS with Bellack	Method 340.1
Distillation.....	Method 340.2
Potentiometric, Ion Selective Electrode.....	Method 340.3
Colorimetric, Automated Complexone.....	

Iodide	Method 345.1
Titrimetric.....	

300 INORGANIC NON METALLICS (Cont.)

Nitrogen (Cont.)

Kjeldahl, Total	Method 351.1
Colorimetric, Automated Phenate.....	
Colorimetric, Semi-Automated	Method 351.2
Block Digester AAII.....	
Colorimetric; Titrimetric; Potentiometric.....	Method 351.3
Potentiometric, Ion Selective Electrode.....	Method 351.4

Nitrate	Method 352.1
Colorimetric, Brucine.....	

Nitrate-Nitrite

Colorimetric, Automated Hydrazine	Method 353.1
Reduction.....	
Colorimetric, Automated Cadmium Reduction.....	Method 353.2
Colorimetric, Manual Cadmium Reduction.....	Method 353.3

Nitrite	Method 354.1
Spectrophotometric.....	

Oxygen, Dissolved	Method 360.1
Membrane Electrode.....	
Modified Winkler (Full Bottle Technique).....	Method 360.2

Phosphorus

All Forms	Method 365.1
Colorimetric, Automated, Ascorbic Acid.....	
Colorimetric, Ascorbic Acid,	Method 365.2
Single Reagent.....	
Colorimetric, Ascorbic Acid,	Method 365.3
Two Reagent.....	
Total	Method 365.4
Colorimetric, Automated, Block Digestor, AA II.....	

Silica, Dissolved	Method 370.1
Colorimetric.....	

Sulfate

Colorimetric, Automated Chloranilate.....	Method 375.1
Colorimetric, Automated Methyl Thymol Blue, AA II.....	Method 375.2
Gravimetric.....	Method 375.3
Turbidimetric.....	Method 375.4

Sulfide

Titrimetric, Iodine.....	Method 376.1
Colorimetric, Methylene Blue.....	Method 376.2

### 300 INORGANIC, NON METALLICS (Cont.)

Sulfite  
    Titrimetric.....Method 377.1

### 400 ORGANICS

Biochemical Oxygen Demand  
    BOD (5 day, 20°C).....Method 405.1

Chemical Oxygen Demand  
    Titrimetric, Mid-Level.....Method 410.1  
    Titrimetric, Low Level.....Method 410.2  
    Titrimetric, High Level for Saline Waters.....Method 410.3  
    Colorimetric, Automated; Manual.....Method 410.4

Oil and Grease, Total Recoverable  
    Gravimetric, Separatory Funnel Extraction.....Method 413.1  
    Spectrophotometric, Infrared.....Method 413.2

Organic Carbon, Total  
    Combustion or Oxidation.....Method 415.1

Petroleum Hydrocarbons, Total, Recoverable  
    Spectrophotometric, Infrared.....Method 418.1

Phenolics, Total Recoverable  
    Spectrophotometric, Manual 4-AAP with Distillation.....Method 420.1  
    Colorimetric, Automated 4-AAP with Distillation.....Method 420.2  
    Spectrophotometric, MBTH with Distillation.....Method 420.3

Methylene Blue Active Substances (MBAS)  
    Colorimetric.....Method 425.1

#### NTA

    Colorimetric, Manual, Zinc-Zincon.....Method 430.1  
    Colorimetric, Automated, Zinc-Zincon.....Method 430.2

Note: Other organic chemicals will be analyzed according to the appropriate gas chromatograph (GC) analytical procedure described in "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods," (U.S. EPA, 1980).

## SAMPLING EQUIPMENT

### Introduction

Sampling the diverse types of RCRA regulated wastes requires a variety of different types of samplers. A number of such sampling devices are described in this section. While some of these samplers are commercially available, others will have to be fabricated by the user. Table 3.2-1 is a general guide to the types of waste that can be sampled by each of the samplers described.

### Table 3.2-1

## SAMPLING EQUIPMENT FOR PARTICULAR WASTE TYPES

[illegible]

### 3.2.1 Composite Liquid Waste Sampler (Coliwasa)

#### Scope and Purpose

The Coliwasa is a device employed to sample free flowing liquids and slurries contained in drums, shallow open top tanks, pits and similar containers. It is especially useful in sampling wastes which consist of a number of immiscible liquid phases.

The Coliwasa consists of a glass, plastic, or metal tube equipped with an end closure which can be opened and closed while the tube is submerged in the material to be sampled.

The Coliwasa was developed by the California Department of Health under a grant from the U.S. EPA and their report, "Samplers and Sampling Procedures for Hazardous Waste Streams" [Appendix I of this manual] should be consulted.

#### General Comments and Precautions

1. Do not use a plastic Coliwasa to sample wastes containing organic materials.
2. Do not use a glass Coliwasa to sample liquids that contain hydrofluoric acid.
3. If significant amounts of solid material are present within 2 inches of the bottom of the container to be sampled, special procedures will be necessary to obtain a representative sample of this solid phase.

## Apparatus

Coliwases are not available commercially and must be fabricated to conform to the specifications detailed in Figure 3.2-1. Table 3.2-2 lists the parts required to fabricate a plastic or glass Coliwasa.

Table 3.2-2

### PARTS FOR CONSTRUCTING A COLIWASA

Quantity	Item	Comments	Supplier
1	Sample tube, translucent PVC plastic, 4.13 cm I.D. x 1.52 m long x 0.4 cm wall thickness	Plastic Coliwasa only	Plastic supply houses
1	Sample tube, borosilicate glass, 4.13 cm I.D. x 1.52 m long	Glass Coliwasa only	Corning Glass Works #72-1602
1	Stopper, neoprene rubber #9		Laboratory supply house
1	Stopper rod, PVC, 0.95 cm O.D. x 1.67 m long	Plastic Coliwasa only	Plastic supply houses
1	Stopper rod, teflon, 0.95 cm O.D. x 1.67 m long	Glass or Plastic Coliwasa	Plastic supply houses
1	Locking block, PVC, 3.8 cm O.D. x 10.2 cm long with 0.56 cm hole in center	Fabricate by drilling 0.56 cm hole through center	Plastic supply houses
1	Locking block sleeve, PVC 4.13 cm I.D. x 6.35 cm long	Fabricate from stock 4.13 cm PVC pipe	Plastic supply houses
1	T-handle, aluminum, 18 cm long x 2.86 cm wide with 1.27 cm wide channel	Fabricate from aluminum bar stock	Hardware stores

Quantity	Item	Comments	Supplier
1	Swivel, aluminum bar 1.27 cm square x 5.08 cm long with 3/8" NC inside thread to attach stopper rod	Fabricate from aluminum bar stock	hardware stores
1	Nut, PVC, 3/8" NC		Plastic supplier
1	Washer, PVC, 3/8" NC		Plastic supplier
1	Nut, stainless steel, 3/8" NC		Hardware stores
1	Washer, stainless steel, 3/8"		Hardware stores
1	Bolt, 3.12 cm long x 3/16" NC		Hardware stores
1	Nut, 3/16" NC		Hardware stores
1	Washer, lock 3/16"		Hardware stores

## Assembly

Assemble sampler as follows:

1. Attach swivel to the T-handle with the 3.12cm long bolt and secure with the 3/16" NC washer and lock nut.
2. Shape stopper into a cone by boring a 0.95 cm hole through the center of the stopper. Insert a short piece of 0.95 cm O.D. handle through the hole until the end of the handle is flush against the bottom (smaller diameter) surface of the stopper. Carefully and uniformly turn the stopper into a cone against a grinding wheel. This is done by turning the stopper with the handle and grinding it down conically from about 0.5 cm of the top (larger diameter) surface to the edge of the 0.95 cm hole on the bottom surface. Attach neoprene stopper to one end of the stopper rod and secure with the 3/8" NC washer and lock nut.
3. Install the stopper and stopper rod assembly in the sampling tube.
4. Secure locking block sleeve on the block with glue or screws.
5. Position the locking block on top of the sampling tube so that the sleeveless portion of the block fits inside the tube, the sleeve sits against the top end of the tube, and the upper end of the stopper rod slips through the center hole of the block.
6. Attach the upper end of the stopper to the swivel of the T-handle.

7. Place the sampler in the closed position and adjust the tension on the stopper by screwing the T-handle in or out.
8. Test the tension by filling the Coliwasa with water to insure it is leak free.

#### Procedure

1. Clean Coliwasa.
2. Adjust sampler's locking mechanism to insure that the stopper provides a tight closure. Open sampler by placing stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
3. Slowly lower the sampler into the waste at a rate which permits the level of liquid inside and outside the sampler to remain the same. If the level of waste in the sampler tube is lower inside than outside, the sampling rate is too fast and will produce a non-representative sample.
4. When the sampler hits the bottom of the waste container, push sampler tube down to close and lock the stopper by turning the T-handle until it is upright and one end rests on the locking block.
5. Withdraw Coliwasa from waste and wipe the outside with a disposable cloth or rag.
6. Place sample tube at mouth of a container and discharge sample by slowly opening the sampler.

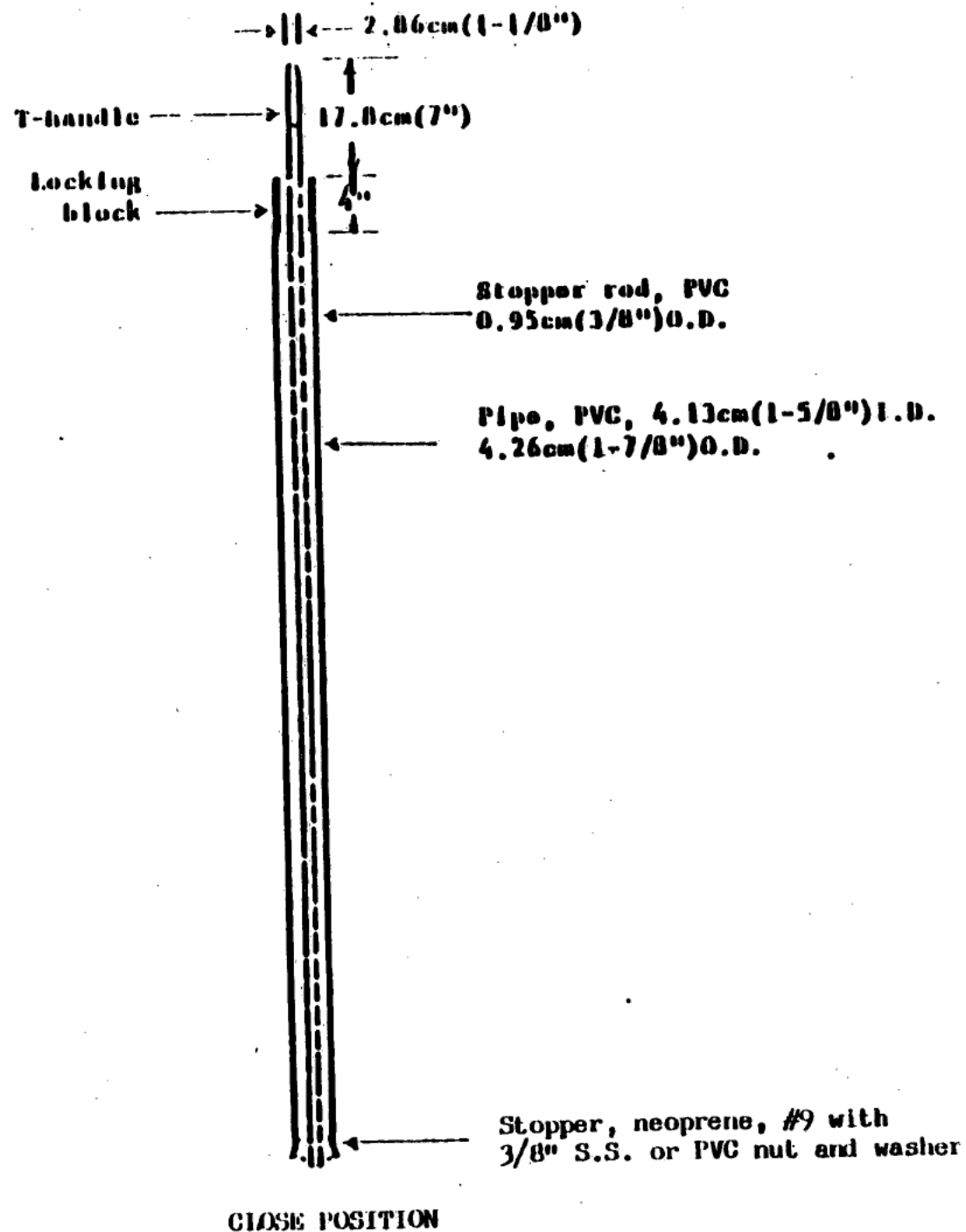
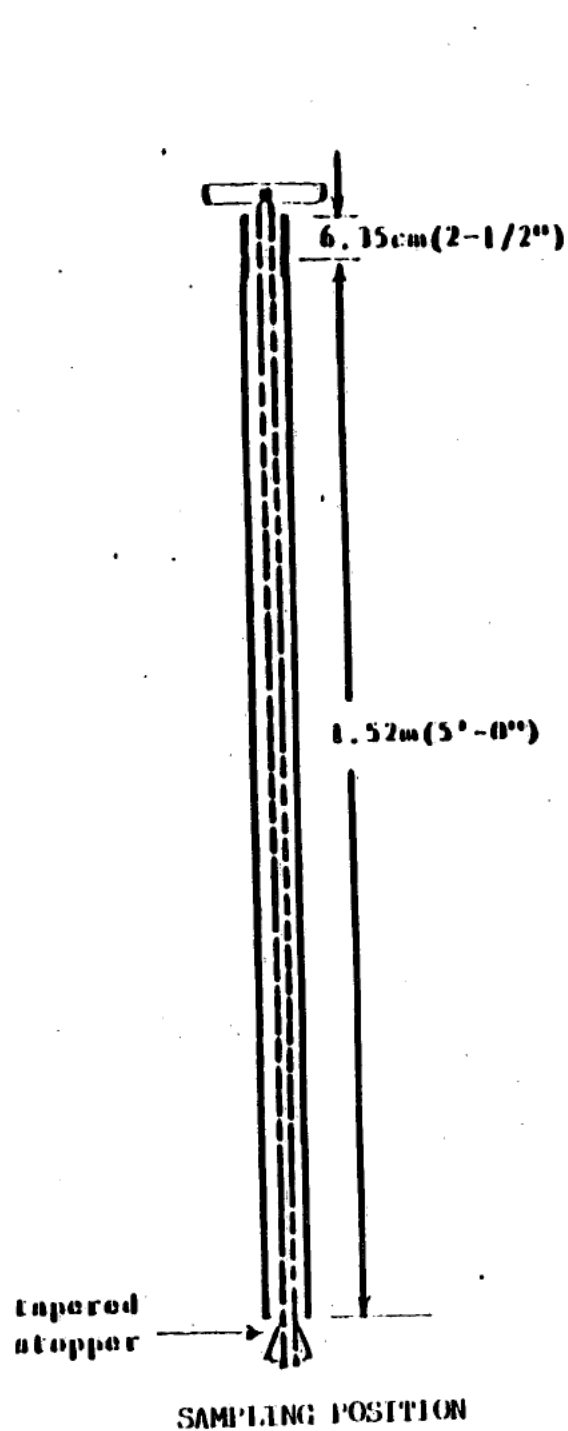


Figure 1.2-1

WATER SAMPLING DEVICE (COLUMBIA)

### 3.2.2 Weighted Bottle

#### Scope and Application

The sampler consists of a glass or plastic bottle, sinker, stopper and a line which is used to lower and raise the bottle and to open the bottle. A weighted bottle samples liquids and free flowing slurries.

#### General Comments and Precautions

1. Do not use a plastic bottle to sample wastes containing organic materials.
2. Do not use a glass bottle to sample wastes that contain hydrofluoric acid.
3. Before sampling insure that the waste will not corrode the sinker, bottle holder or line.

#### Apparatus

A weighted bottle with line is built to the specifications in ASTM Methods D 270 and E 300 (Figure 3-2-2).

#### Procedure

1. Clean bottle.
  2. Assemble weighted bottle sampler.
  3. Lower the sampler to directed depth and pull out the bottle stopper by jerking the line.
  4. Allow bottle to fill completely as evidenced by cessation of air bubbles.
  5. Raise sampler, cap and wipe off with a disposable cloth.
- The bottle can serve as a sample container.

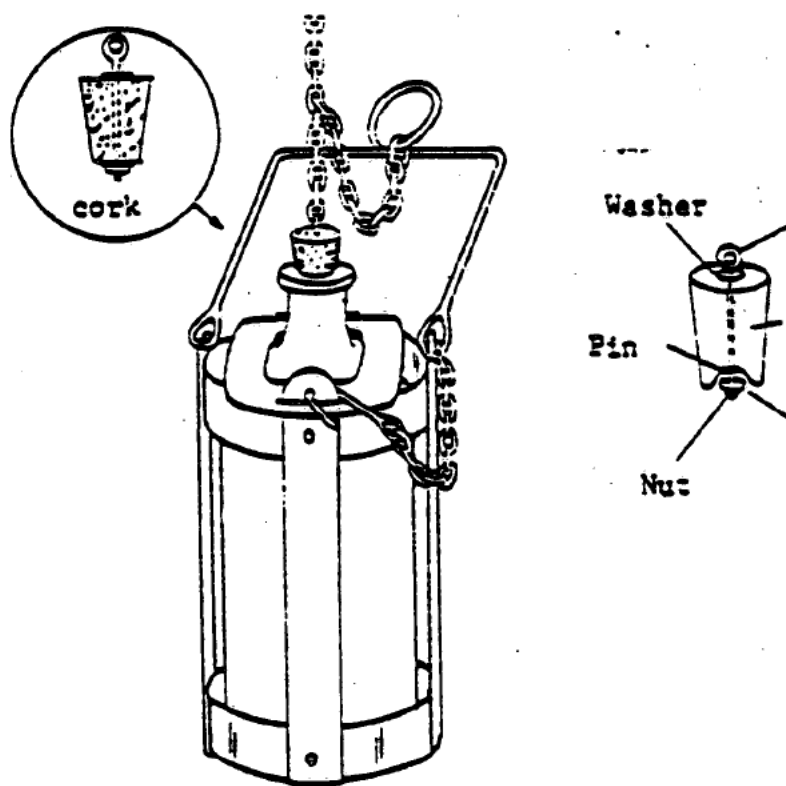


Figure 3.2  
WEIGHTED BOTTLE SAMPLER

### 3.2.3 Dipper

#### Scope and Application

The dipper consists of a glass or plastic beaker clamped to the end of a 2 or 3 piece telescoping aluminum or fiberglass pole which serves as the handle. A dipper samples liquids and free flowing slurries.

#### General Comments and Precautions

1. Do not use a plastic beaker to sample wastes containing organic materials.
2. Do not use a glass beaker to sample wastes of high pH or which contain hydrofluoric acid.
3. Paint aluminum pole and clamp with a 2 part epoxy or other chemical resistant paint when sampling either alkaline or acidic wastes.

#### Apparatus

Dippers are not available commercially and must be fabricated to conform to the specifications detailed in Figure 3.2-3. Table 3.2-3 lists the parts required to fabricate a dipper.

Table 2.2-3  
PARTS FOR CONSTRUCTING A DIPPER

Quantity	Item	Supplier
1	Adjustable clamp, 6.4 to 8.9 cm (2 1/2 to 3 1/2") for 250 to 600 ml beakers. Heavy duty aluminum.	Laboratory supply houses
1	Tube 2.5 to 4.5 meters long with joint cam locking mechanism. Diameter 2.54 cm ID and 3.18 cm ID.	Swimming pool supply houses

Quantity	Item	Supplier
1	Polypropylene or glass beaker, 250 ml to 600 ml.	Laboratory supply houses
4	Bolts 2 1/4" x 1/4", NC	Hardware stores
4	Nuts, 1/4", NC	Hardware stores

### Procedure

1. Clean beaker, clamp, and handle.
2. Assemble dipper by bolting adjustable clamp to the pole.  
Place beaker in clamp and fasten shut.
3. Turn dipper so the mouth of the beaker faces down and insert into waste material. Turn beaker right side up when dipper is at desired depth. Allow beaker to fill completely as shown by the cessation of air bubbles.
4. Raise dipper and transfer sample to container.

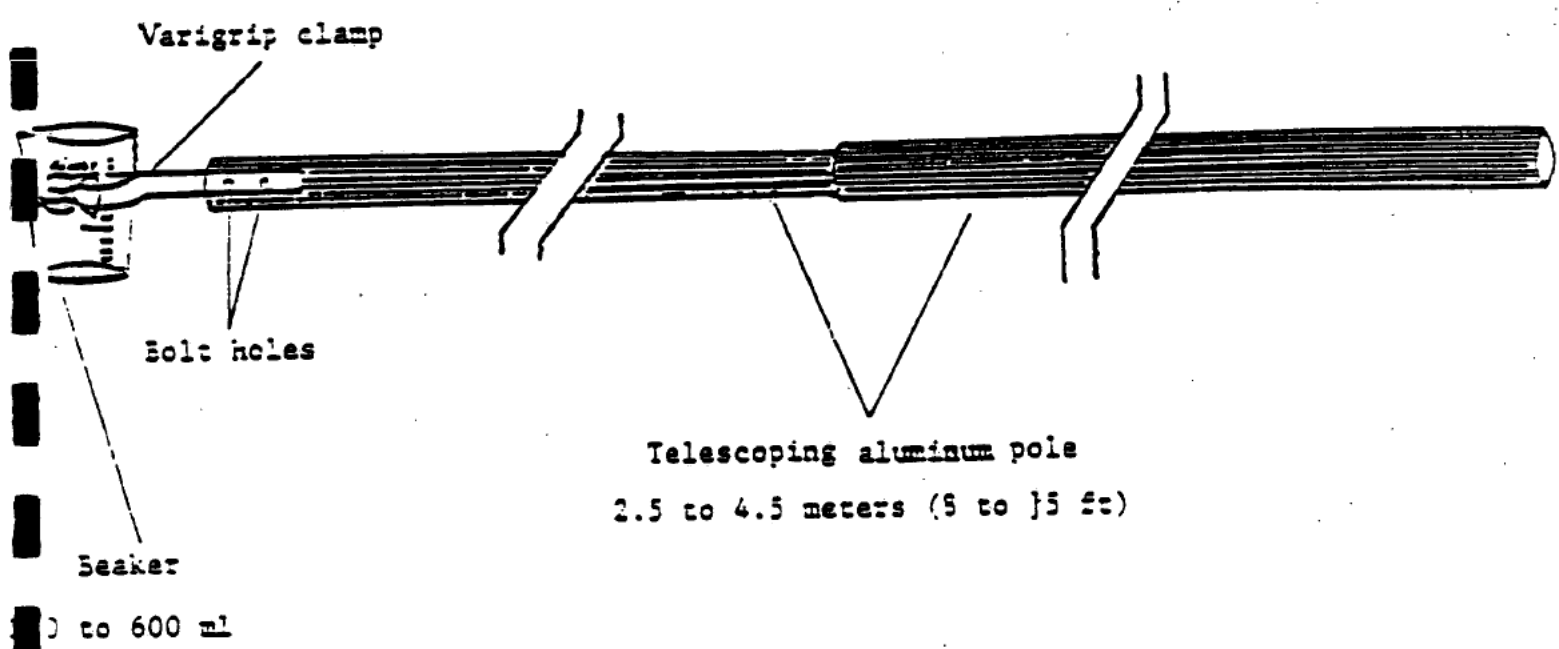


Figure 3.2-3  
DIPPER

### 3.2.4 Thief

#### Scope and Application

A thief consists of two slotted concentric tubes usually made of stainless steel or brass. The outer tube has a conical pointed tip which permits the sampler to penetrate the material being sampled. The inner tube is rotated to open and close the sampler. A thief is used to sample dry granules or powdered wastes whose particle diameter is less than  $1/3$  the width of the slots.

#### Apparatus

A thief is available at laboratory supply stores. (Figure 3.2-4)

#### Procedure

1. Clean sampler.
2. Insert closed thief into waste material. Rotate inner tube to open thief. Wiggle the unit to encourage material to flow into thief. Close thief and withdraw. Place sampler thief in a horizontal position with the slots facing upward. Remove inner tube from thief and transfer sample to a container.

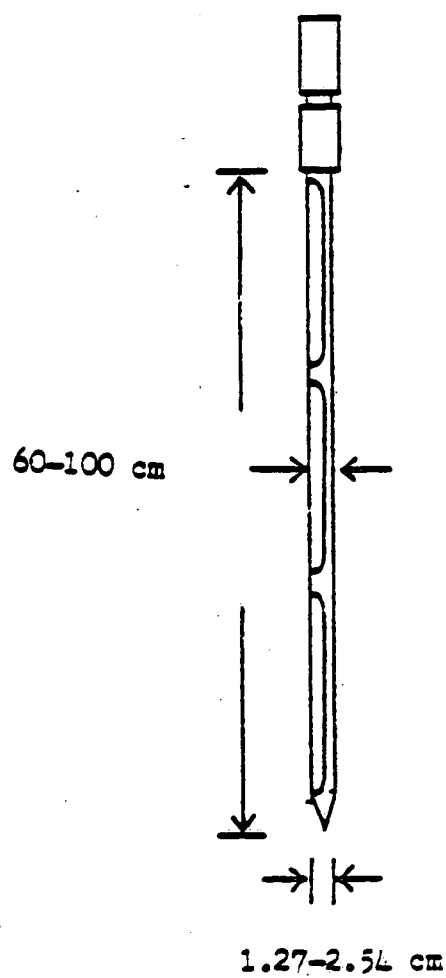


Figure 3.2-1  
THIEF SAMPLER

### 3.2.5 Trier

#### Scope and Application

A trier consists of a tube cut in half lengthwise with a sharpened tip that allows the sampler to cut into sticky solids and loosen soil. A trier samples moist or sticky solids with a particle diameter less than  $1/2$  the diameter of the trier.

#### Apparatus

1. Triers 61 to 100 cm long and 1.27 to 2.54 cm in diameter are available at laboratory supply stores.
2. A large trier can be fabricated to conform to the specifications in Figure 3-5. A metal or polyvinyl chloride pipe 1.52 m (5') long x 3.2 cm (1.4") I.D. with a 0.32 cm (1 1/8") wall thickness is needed. The pipe should be sawed lengthwise, about 60-40 split, to form a trough stretching from one end to 10 cm away from the other end. The edges of the slot and the tip of the pipe are sharpened to permit the sampler to cut into the waste material being sampled. The unsplit length of the pipe serves as the handle.

#### Procedure

1. Clean trier.
2. Insert trier into waste material 0 to 45° from horizontal. Rotate trier to cut a core of the waste. Remove trier with concave side up and transfer sample to container.

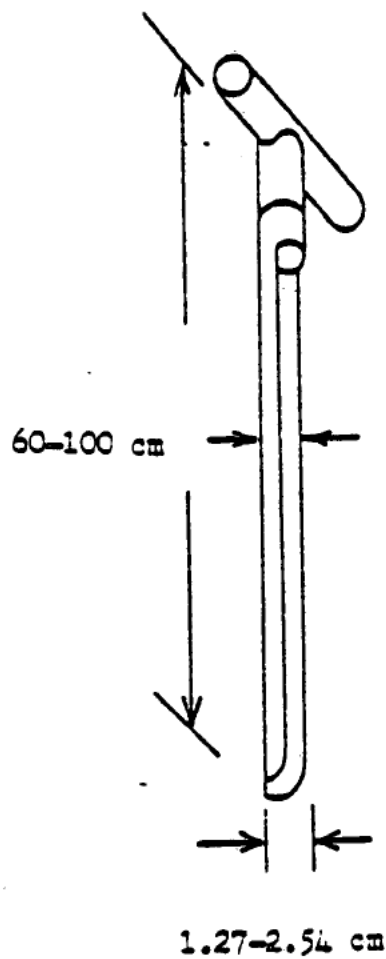
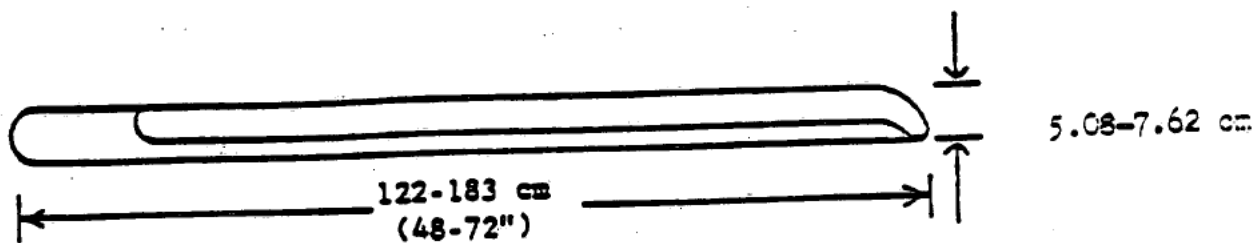


Figure 3.2-5  
SAMPLING TRIERS

### 3.2.6 Auger

#### Scope and Application

An auger consists of sharpened spiral blades attached to a hard metal central shaft. An auger samples hard or packed solid wastes or soil.

#### Apparatus

Augers are available at hardware and laboratory supply stores.

#### Procedures

1. Clean sampler.
2. Bore a hole through the middle of an aluminum pie pan large enough to allow the blade of the auger to pass through. The pan will be used to catch the sample brought to the surface by the auger.
3. Place pan against the sampling point. Auger through the hole in the pan until the desired sampling depth is reached. Back off the auger and transfer the sample in the pan and adhering to the auger to a container. Spoon out the rest of the loosened sample with a sample trier.

### 3.2.7 Scoop and Shovel

#### Scope and Application

Scoops and shovels are used to sample granular or powdered material in bins, shallow containers and conveyor belts.

#### Apparatus

Scoops are available at laboratory supply houses. Flat nosed shovels are available at hardware stores.

#### Procedure

1. Clean sampler.
2. Obtain a full cross section of the waste material with the scoop or shovel large enough to contain the waste collected in one cross section sweep.

Sub-Section 3.3

SAMPLE CONTAINERS

Containers

The most important factors to consider when choosing containers for hazardous waste samples are compatibility with the waste, cost, resistance to breakage, and volume. Containers must not distort, rupture, or leak as a result of chemical reactions with constituents of waste samples. Thus, it is important to have some idea of the properties and composition of the waste. The containers must have adequate wall thickness to withstand handling during sample collection and transport to the laboratory. Containers with wide mouths are desirable to facilitate transfer of samples from samplers to containers. Also, the containers must be large enough to contain the required volume of sample or the entire volume of a sample contained in samplers.

Plastic and glass containers are generally used for collecting and storing of hazardous waste samples. Commonly available plastic containers are made of high-density or linear polyethylene (LPE), conventional polyethylene, polypropylene, polycarbonate, teflon FEP (fluorinated ethylene propylene), polyvinyl chloride (PVC), or polymethylpentene. Teflon FEP is almost universally usable due to its chemical inertness and resistance to breakage. However, its high cost severely limits its use. LPE, on the other hand, offers the best combination of chemical resistance and low cost when inorganic wastes are involved.

Glass containers are relatively inert to most chemicals and can be used to collect and store almost all hazardous waste samples except those that contain strong alkali and hydrofluoric acid. Soda glass bottles are suggested due to their low cost and ready availability. Borosilicate glass containers, such as Pyrex and Corex, have advantages relative to inertness and resistance to breakage respectively but are expensive and not always readily available. Glass containers are generally more fragile and much heavier than plastic containers. Glass or FEP containers must be used for waste samples that will be analyzed for organic compounds.

The containers must have tight, screw-type lids. Plastic bottles are usually provided with screw caps made of the same material as the bottles. Buttress threads are recommended. Cap liners are not usually required for plastic containers. Teflon cap liners should be used with glass containers supplied with rigid plastic screw caps. These caps are usually provided with waxed paper liners. Other liners that may be suitable are polyethylene, polypropylene, neoprene, and teflon FEP plastics. Teflon liners may be purchased from plastic specialty supply houses (e.g., Scientific Specialties Service, Inc., P.O. Box 352, Randallstown, Maryland 21133).

**APPENDIX G.6**

**Coordination Agreement Letters**



ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

LEBRON  
ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Dr. Rafael García  
Medical Director  
Peñuelas Medical Center  
P.O. Box 38  
Peñuelas, P.R. 00724

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Dr. García:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide medical assistance to affected personnel.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.



ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENÉ PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

LEBRON  
ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Dr. Rafael García  
Medical Director  
Peñuelas Medical Center  
P.O. Box 38  
Peñuelas, P.R. 00724

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Dr. García:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

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- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide medical assistance to affected personnel.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Dr. Rafael García  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,



*Pedro A. Marrero*  
Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

nap

Enclosure



ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

LEBRON  
ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Sgt. Milton Torres  
Fire Department  
P.O. Box 72  
Peñuelas, P.R. 00724

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Sgt. Torres:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide support to the facility during periods of fire occurrence, in order to correct the situation as soon as possible.
- 2) Provide advising to the facility on-site in terms of fire prevention measures.
- 3) Provide additional personnel fire safety equipment to the facility, if needed, and whenever possible.
- 4) Provide assistance in facility evacuation procedures during fire periods.

Sgt. Milton Torres  
June 16, 1986  
Page 2

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
.. President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

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Cordially,

*Pedro A. Marrero*

Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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ASSOCIATES



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HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. Juan Luis Segarra  
Civil Defense  
P.O. Box 10  
Peñuelas, P.R. 00724

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Segarra:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide personnel to give additional support to the facility to attend the emergency.
- 2) Provide aid to implement facility evacuation procedures whenever needed.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Mr. Juan Luis Segarra  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,

*Pedro A. Marrero*

Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

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IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. Erasmo Santos  
President  
Ponce Waste Disposal, Inc.  
P.O. Box 111  
Mercedita, Ponce, P.R. 00715

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Santos:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide hazardous waste transportation services, if needed, in relation to the wastes generated as a result of the implementation of the HWCP procedures.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Mr. Erasmo Santos  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,

*Pedro A. Marrero*

Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. Jorge Arrufat-Vera  
President  
Caribe Hydroblasting, Inc.  
P.O. Box 7343  
Ponce, Puerto Rico 090731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Arrufat-Vera:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide hazardous waste transportation services, if needed, in relation to the wastes generated as a result of the implementation of the HWCP procedures.
- 2) Provide hazardous waste clean-up services, if needed, in relation to the wastes generated as a result of the implementation of the HWCP procedures.
- 3) Provide assistance to PROTECO in terms of personnel and equipment (if needed and when it is feasible).



ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

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ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. Julio Gutiérrez  
Indochem Services, Inc.  
El Tuque Industrial Park  
Ponce, P.R. 00731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Gutiérrez:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide hazardous waste transportation services, if needed, for the wastes generated as a result of the implementation of the HWCP procedures.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Mr. Jorge Arrufat-Vera  
June 16, 1986  
Page 2

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,

*Pedro A. Marrero*

Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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LEBRON  
ASSOCIATES

Mr. Julio Gutiérrez  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
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Protección Técnica Ecológica, Inc.  
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Ponce, Puerto Rico 00731

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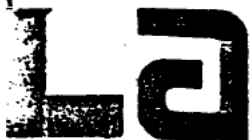
Cordially,

*Pedro A. Marrero*  
Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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LEBRON  
ASSOCIATES



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ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Eng. Eduardo Fraticelli  
Eduardo Fraticelli, Inc.  
Firm Delivery  
Ponce, P.R. 00731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear engineer Fraticelli:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide hazardous waste transportation services, if needed, in relation to the wastes generated as a result of the implementation of the HWCP procedures.
- 2) Provide assistance to PROTECO in terms of personnel and equipment (if needed and when it is feasible).

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Eng. Eduardo Fraticelli  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

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President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,

*Pedro A. Marrero*

Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

LEBRON  
ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. Cruz Sierra  
Tallaboa Heavy Equipment  
Firm Delivery  
Ponce, P.R. 00731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Sierra:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Being an available contractor to the facility for heavy equipment leasing and operation. This may include bulldozers, loaders, trucks, etc. that will be utilized for spill control in attending the related emergencies.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.


Dr. Antonio Fernández-Durán  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

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President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

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Cordially,

  
*Pedro A. Marrero*  
Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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LEBRON  
ASSOCIATES

ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

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RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Dr. Antonio Fernández-Durán  
Hospital de Damas  
Ponce, P.R. 00731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Dr. Fernández-Durán:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

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Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide medical assistance to affected personnel.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.



ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

FELIPE LEBRON-RAMIREZ, P.E.  
RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

LEBRON  
ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Lt. Luis R. Torres-Santiago  
Puerto Rico Police Department  
P.O. Box 602  
Peñuelas, Puerto Rico 00724

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Lt. Torres-Santiago:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Control of traffic movement into and out of the facility throughout all the emergency period to avoid any disruptions of the HWCP procedures caused by improper traffic movement.
- 2) Provide personnel to give additional support to PROTECO for attending the emergency.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

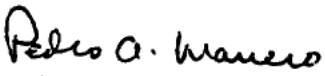
Lt. Luis R. Torres-Santiago  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,

  
Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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Enclosure

  
LEBRON  
ASSOCIATES

Mr. Cruz Sierra  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
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Ponce, Puerto Rico 00731

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Cordially,



*Pedro A. Marrero*  
Pedro A. Marrero, P.E.  
Director, Environmental  
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HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. George Alonso  
Acting President  
Guayanilla Heavy Equipment  
Firm Delivery  
Ponce, Puerto Rico 00731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Alonso:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Being an available contractor to the facility for heavy equipment leasing and operation. This may include bulldozers, loaders, trucks, etc. that will be utilized for spill control in attending the related emergencies.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Mr. George Alonso  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

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Cordially,



*Pedro A. Marrero*  
Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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ENGINEERING, ARCHITECTURAL AND PLANNING CONSULTANTS

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PEDRO A. MARRERO, P.E.

LEBRON  
ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Eng. Allan R. Nazario  
Industrial Chemical Corp.  
Firm Delivery  
Ponce, P.R. 00731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Nazario:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide PROTECO with the available support and help to attend the emergency whenever feasible. This may include the provision of equipment, personnel, and other resources.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Eng. Allan R. Nazario  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,



*Pedro A. Marrero*  
Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

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PEDRO A. MARRERO, P.E.

LEBRON  
ASSOCIATES

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. Francisco Forteza  
Manager  
Shell Co. P.R., Inc.  
P.O. Box 2768  
San Juan, P.R. 00936

LEBRON ASSOCIATES

F.L. \_\_\_\_\_

R.P. \_\_\_\_\_

H.T. \_\_\_\_\_

H.M. \_\_\_\_\_

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Forteza:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide PROTECO with the available support and help to attend the emergency whenever feasible. This may include the provision of equipment, personnel and other resources.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Mr. Francisco Forteza  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
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Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,



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RENE PURCELL-GATELL, P.E.  
HECTOR ZAVALA-TORO, P.E.  
PEDRO A. MARRERO, P.E.

IN REPLY, PLEASE REFER TO:  
LA'S PROJECT NO. 86-033

June 16, 1986

Mr. Héctor Lagares  
Lagares Sewer Services, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Re: PROTECO Hazardous Waste  
Contingency Facility

Dear Mr. Lagares:

As per 40 CFR, Parts 264.53 and 265.53, enclosed please find a copy of the Hazardous Waste Contingency Plan (HWCP), presently available at PROTECO for immediate response to any emergency that may arise as a result of PROTECO hazardous waste management on-site activities. The reason for sending you this plan on behalf of PROTECO, Inc. is the following:

- 1) To let your facility become familiar with the procedures stated in the plan, in order to allow PROTECO to utilize the services of your facility for emergencies of this type (which are hereby respectfully requested), and
- 2) to let your facility be able to submit to PROTECO any comments and/or recommendations regarding the enclosed HWCP.

Specifically, the roles of your facility, in case an emergency of this type at PROTECO arises, can be summarized as follows:

- 1) Provide hazardous waste transportation services, if needed, in relation to the wastes generated as a result of the implementation of the HWCP procedures.

A meeting will be held on July 15, 1986 at PROTECO facilities with all the authorities, agencies, private contractors and firms in the vicinity of PROTECO that may be involved in the implementation of the HWCP. The purpose of this meeting is to discuss the procedures addressed in the plan and the corresponding role of each of the specific entities.

Mr. Héctor Lagares  
June 16, 1986  
Page 2

For these reasons, PROTECO will be very pleased to have you attend this meeting and welcomes your comments/recommendations concerning such plan to be submitted not later than July 10, 1986. These comments/recommendations should be forwarded to the following address:

Dr. Jorge Fernández-Pabón  
President  
Protección Técnica Ecológica, Inc.  
Firm Delivery  
Ponce, Puerto Rico 00731

Your help and support related to this extremely important aspect will be greatly appreciated. Thank you for your cooperation.

Cordially,



LEBRON  
ASSOCIATES

*Pedro A. Marrero*  
Pedro A. Marrero, P.E.  
Director, Environmental  
Engineering Department

nap

Enclosure

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## SECTION H

PERSONNEL TRAINING

The information contained in this section outlines the existing PROTECO personnel training program. This information is submitted in accordance with the requirements of 40 CFR 270.14(b) (12) and 264.16 and the Puerto Rico Environmental Quality Board, Part VIII, Rule 808.

H-1 Description of the Existing Personnel Training Program  
[40 CFR 122.25(a)(12)]

This program was developed to ensure that facility personnel are properly trained in hazardous waste management. It is the general manager's responsibility to have the training programs conducted and to provide for adequate documentation of personnel trained by these training programs. The employee training program consists of the following parts:

- an initial hazardous waste management orientation, which includes a review of the PROTECO Training Manual. (Appendix H.1)
- a required reading file
- specific on-the-job training
- an annual review
- seminars and classroom training

H-1a Initial Orientation

The purpose of the hazardous waste management orientation is to train personnel involved with the storage, treatment, or disposal of hazardous waste or the maintenance of hazardous waste equipment and systems. This training program is designed to be a general introduction to hazardous waste management.

The program is conducted for any new employee within the first six months of employment. This orientation includes the following:

- defining hazardous waste, generator, transporter and treatment, storage and disposal facility
- requirements for generators
- familiarization with emergency procedures/implementation plans
- familiarization with emergency equipment and monitoring equipment

A copy of the hazardous waste orientation meeting outline is provided in Appendix H.2. Attendance of the meeting by facility personnel is documented on a log. A copy of this log is kept as part of the employee files and will be maintained for the life of the facility, or for three years after the termination of employment, whichever comes first.

#### H-1b Reading File

The purpose of the reading file is to maintain a file of required training material to be read by all management personnel (general manager, lab manager, operations managers, and supervisors) whose operations are defined to include generating, storage, treatment, or disposal of hazardous waste or whose operations include maintaining hazardous waste equipment and systems. The reading file conveys information on hazardous waste management practices.

Documents in the reading file include any required plans such as emergency plans, contingency plans, closure plans, and waste analysis plans. Additional documents may include standard operating procedures, specifications, manuals, pamphlets, etc., that establish or explain hazardous waste management procedures that are or can be followed at the facility.

#### H-1c On-the-Job Training

All employees directly involved with the handling or transportation of hazardous waste also receive on-the-job training to augment the hazardous waste management orientation and to provide additional competence in the handling or transportation of hazardous waste. This training is conducted under the direction of the general manager. On-the-job training provides the employees with the time to become acquainted with the facility operations. The immediate supervisor instructs all new employees prior to starting any new job function. He instructs them in proper job operations and how to work the facility equipment. Should there be any question about the prescribed safe method of operation, the immediate supervisor is consulted for clarification.

#### H-1d Annual Reviews

An annual review was conducted for all personnel employed by the facility in 1986. PROTECO will continue to hold annual reviews for all facility personnel.

#### H-1e Seminars

Seminars involving classroom training are conducted by facility management personnel. These seminars are attended by all or specific groups of employees, depending on the seminars subject area. Seminar subject areas include:

- Contingency Planning and Emergency Response
- Facility Operations
- Waste Analysis and Monitoring
- Waste Transportation
- Handling of Hazardous Wastes

#### H-2 Job Titles and Duties [40 CFR 264.16(d)(1),(2)]

Figure H-1 is the Organizational Chart for PROTECO. All employees except the maintenance personnel and the security guards are directly  
(0558B)

FIGURE H-1

The present organizational chart for the PROTECO facility is shown in Appendix H.3.

involved with the handling of hazardous wastes. Maintenance personnel (i.e., mechanics and welders) may work in the various waste treatment, storage or disposal areas, but normally do not handle the hazardous wastes directly. Security guards never handle the wastes directly, however, they must be familiar with the facility layout, operations and organization to be able to respond to an emergency situation.

The general manager's responsibilities at the facility includes insuring facility compliance with the RCRA regulations. This job does not involve actual handling of hazardous wastes. The facility chemist shares the general manager's responsibility for facility compliance with the RCRA regulations and is also involved in the actual handling of hazardous wastes under the facility's sampling and waste analysis program. The duties, responsibilities and qualifications of the positions described above are provided in Appendix H.3.

### H-3 Training Director [40 CFR 264.16]

The classroom portion of the personnel training program is directed by the Lab Manager. Lab Manager qualifications include a B.S. degree in chemistry. The Lab Manager is familiar with all PROTECO treatment, storage, and disposal procedures and processes, the hazardous wastes accepted by the facility, safe procedures and equipment for handling hazardous materials and the RCRA and EQB hazardous waste regulations.

On-the-job training is provided by the facility supervisors who are extremely knowledgeable concerning the hazardous waste treatment procedures and processes. These supervisors are ultimately responsible for determining if an employee has mastered the skills necessary to perform the job tasks.

### H-4 Relevance of Training to Job Position [40 CFR 264.16(c)(3)]

The Lab Manager is responsible for conducting hazardous waste management training programs including contingency plan implementation and

emergency response procedures, to all waste handling personnel. A relatively small number of individuals are in supervisory and decision-making positions with a degree of authority and responsibility which warrants broad training in all aspects of hazardous waste management pertinent to their facility. Therefore, in order to provide the needed training to personnel at the levels that are relevant to their positions within the facility, the training program is tiered.

For example, the level of instruction which management personnel receive should be reasonably comprehensive and should constitute a relatively detailed overview of all pertinent aspects of hazardous waste management. Other personnel, having more limited spheres of activity, responsibility and authority, are trained at a level less comprehensive than that applicable to management personnel. Furthermore, depending on the specific position, training in one or more areas may not be necessary. Figure H-2 describes the level of training received by various personnel employed at the facility.

The facility maintains a written record of all outside training programs, classroom training and on-the-job training received by each employee as well as amount of introductory and continuing training programs related to hazardous waste management. These records will be kept in the laboratory for inspection.

#### H-5 Emergency Response Training [40 CFR 264.16(1)(3)]

This training program is designed to ensure that personnel not only handle hazardous wastes in a safe manner but are also able to properly respond to emergency situations. The program trains hazardous waste handling/management personnel to maintain compliance with RCRA under both normal operating conditions and emergency situations. Personnel attend information lectures and receive on-the-job training drills in the field (i.e., fire fighting, spill response, communications). These training drills are held at least twice a year.

**FIGURE H-2**  
**APPLICABLE TRAINING**

	TRAINING FOR PERSONNEL SAFETY	CONTINGENCY PLAN	EMERGENCY PROCEDURES	WASTE HANDLING AND STORAGE PROCEDURES	TREATMENT FACILITIES OPERATION/MAINT.	INSPECTION PROCEDURES	FACILITY SECURITY	WASTE SECURITY	WASTE ANALYSIS PLAN	DOT REQUIREMENTS	RECORD KEEPING
GENERAL MANAGER	C	C	C	C	C	C	C	C	C	C	C
FACILITY CHEMIST	C	C	C	C	C	C	C	C	C	C	C
FIELD SUPERVISOR	C	C	C	C	C	C	C	B	C	C	C
OPERATION SUPERVISOR	B	C	C	C	C	C	B	B	B	B	C
EQUIPMENT OPERATOR	B	B	B	B	B						
WASTE HANDLER	B	B	B	B	B						
MAINTENANCE STAFF	B	B	B								
TRANSPORTATION STAFF	B	B	B						C	C	
SECURITY GUARDS		B	B			B	C				
CLERICAL STAFF			B								C

C - COMPREHENSIVE INSTRUCTION  
B - BASIC INSTRUCTION

Training elements addressing non-routine and emergency situations include:

- Procedures for locating, using, inspecting, repairing and replacing facility safety, emergency and monitoring equipment
- Emergency communication procedures and alarm systems
- Response to spills or releases
- Response to fires or explosions
- Procedures to be followed to remove a surface impoundment from service
- Response to contamination incidents
- Decontamination of equipment
- Shutdown of operations
- Personnel protective equipment
- Procedures for evacuation

H-6 Personnel Training Manual [40 CFR 264.16(a)(1) and (3)]

In addition to the program already developed at PROTECO for training employees in the safe handling of hazardous wastes, PROTECO organized the information into a "Personnel Training Manual". Provisions have been incorporated by the facility for updating or revising the text as necessary to ensure compliance with all regulations applicable to the facility (OSHA, RCRA, DOT) and with the terms of the RCRA Part B permit. An outline of the training manual is shown in Figure H-3. The complete training manual is given in Appendix H.1.

All management personnel and supervisors will be provided with a copy of the training manual. A copy of the manual will also be kept at the Penuelas office for employees to review, and as a result, it is also available to EPA officials for review.

FIGURE H-3

OUTLINE OF PERSONNEL TRAINING MANUAL

I. Introduction

- A. The Resource Conservation and Recovery Act--RCRA
- B. 40 CFR Part 262, 263, 264, 270
- C. Environmental Quality Board (EQB) Regulations
- D. RCRA Part B Permit (once received)

II. Prevention of Hazard

- A. Hazardous Wastes Accepted at the Facility
- B. Associated Hazards
- C. Personnel Protective Equipment

III. Working Elements of the Facility Program

- A. Waste Analysis and Sampling Techniques
- B. Security
- C. Inspections
- D. Description of Container Storage Area
- E. Description of Tank Storage Area

FIGURE H-3 (CONTINUED)

OUTLINE OF HAZARDOUS TRAINING MANUAL

F. Standard Operating Procedures

1. Pozzolanic Immobilization
2. Anaerobic Digestion
3. Neutralization/Evaporation

G. Key Terms of the Permit

H. Recordkeeping and Reporting Requirements

I. DOT Requirements

1. Labeling
2. Marking

IV. Emergency Procedures and Contingency Plans

- A. Emergency Coordinators (Primary and Alternates)
- B. Emergency Communications/Phone Numbers and Alarms
- C. Emergency Response Procedures
- D. Location, Maintenance, Inspections and Use of Emergency Equipment
- E. Response to Contamination Incidents
- F. Response to Fires or Explosions
- G. Response to Removal of a Surface Impoundment from Service
- H. Shutdown of Operations/Evacuation
- I. Required Report

This manual is used as the basis for the annual training of all employees already trained by PROTECO and in conducting the training of all new employees. During the training program, employees are instructed on the following topics:

- the purpose of RCRA and importance of maintaining compliance with the regulations
- the hazardous nature of the wastes stored, treated or disposed of at the facility
- proper handling and storage procedures for these wastes emergency procedures and contingency plans.

This manual will be used as a framework for training PROTECO personnel in the proper procedures, equipment and systems to be used in managing hazardous wastes.

A brief description of each section of the training manual follows

#### Section 1 - Introduction

This section focuses on the Resource Conservation and Recovery Act (RCRA) and the regulations stemming from this act. The regulatory framework for classifying hazardous waste, setting operational standards and achieving compliance are explored. In addition, standards for generators and transporters are discussed. The RCRA permit for PROTECO (once it is received) will be reviewed and studied as part of this course to ensure that all employees are familiar with its terms and content.

#### Section 2 - Hazardous Wastes

This section focuses on the hazardous wastes treated, stored or disposed of at PROTECO and the nature of their hazardous characteristics. In this context, the terms toxicity, reactivity, corrosivity and ignitability will be defined. Employees are taught how wastes can be harmful to human health and the environment. In addition, the course introduces the use of personnel protective equipment and other safety equipment used to prevent accidental exposures to workers and releases to the environment.

### Section 3 - Facility and Process Description

This section focuses on the types of hazardous wastes that are treated and disposed of in the various treatment operations (i.e., stabilization/-fixation and neutralization, storage and disposal operations) and the procedures for maintaining compliance with the RCRA permit (i.e., record-keeping, inspections and security). A site diagram showing the dimensions, capacity and relative position of each treatment, storage and disposal area are included in the manual.

Training for normal or routine operating conditions includes the following topics

- DOT regulations for marking and labeling
- proper operation and maintenance of the treatment, storage and disposal facilities
- standard operating procedures
- purpose and use of scheduled inspections
- purpose and use of security and communications systems
- proper handling of ignitable or incompatible wastes
- procedures to prevent hazards
- monitoring requirements for tracking and recording the operation of the facility
- sampling and analysis program
- recordkeeping requirements and procedures

### Section 4 - Emergency Procedures and Contingency Plan

The fourth section of the training manual provides detailed instruction on the steps to be taken in the event of an emergency such as a waste spill, fire, explosion, damage to a tank or surface impoundment or damage from wind and storms. The emergency coordinator is clearly identified as are emergency phone numbers and directions for locating and using on-site emergency equipment. In addition, details of the contingency plan are enumerated.

This manual is used in the classroom for both introductory training and annual review. All personnel involved in hazardous waste management are required to complete 20 hours of classroom instruction in addition to 6 weeks on-the-job training. In addition, personnel complete an 8-hour classroom review training session once a year.

#### H-7 Implementation of Training Program [40 CFR 264.16(b),(c)]

All personnel currently involved in hazardous waste activities at the facility have either been fully trained at the time of this submittal or are presently being trained under the direct supervision of a fully trained staff member.

All new personnel will complete this training program by using the personnel training manual within 6 months of assignment to any of the hazardous waste treatment/storage facilities or within 6 months of their date of employment, whichever is later. No employee hired to work at the facility will work unsupervised prior to completion of the training program.

Employees have been required to attend personnel training sessions at least annually for review. The updated personnel training program provides an annual review using the personnel training manual and discusses the following subjects:

1. All hazardous wastes currently being handled at the facility, noting any changes in waste type, volume, source, characteristics or location that have occurred during the past year.
2. The status of storage and operating conditions and procedures, noting any areas where there are problems or potential for problems. Employees participate in developing effective solutions.

3. The requirements contained in the facility's RCRA permit, noting any changes that have occurred during the past year. Areas where maintenance of compliance is a problem are identified and discussed, and effective solutions are sought.
4. Incidents that have occurred in the past year that warranted use of contingency plans and/or emergency action. This review focuses on the cause of the incident and identification of steps to prevent or to ensure better handling of such events in the future.

Records documenting the job title for each position, job descriptions, names of employees, and completed training programs (both introductory and review) are and will be maintained at the facility. These records will be kept until closure of the facility for current employees and for three years from the date of an individual employee's last working day for former employees.

APPENDIX H.1



## Protección Técnica Ecológica

### CARGANDO Y DESCARGANDO MATERIAL PELIGROSO Y NO PELIGROSO

#### La importancia del buen manejo de desperdicios

La Transportación de Desperdicios ya sean éstos peligrosos o no peligrosos es uno de los puntos más delicados y que requiere mayor atención en lo que respecta al buen funcionamiento operacional de una facilidad como la nuestra.

Es por esto y otros motivos no menos importantes que el personal utilizado para estos fines debe ser uno capaz de responder en todo momento a cualquier tipo de eventualidad, para evitar al máximo daños al ambiente y al ser humano. A la misma vez, debe ser uno con un amplio conocimiento de los requisitos y la documentación necesaria para el manejo de estos materiales.

El equipo utilizado (vehículos, tanques, arrastres, etc.) debe de estar en su grado óptimo de funcionamiento y ser objeto de una frecuente evaluación para minimizar los fallos que pudieran ocasionar accidentes y mal funcionamiento. Es por esta razón que el recojido y transportación de desperdicios peligrosos y no peligrosos debe ser el más seguro al ambiente, a tenor con las Reglamentaciones Locales y Federales concernientes.

#### Requisitos de pre-transportación (generadores)

Anterior a la recojida de cualquier tipo de desperdicio es necesario cumplir con una serie de requisitos que nos garantizará que el servicio que nosotros ofrecemos será uno de óptimas condiciones. Estos requisitos son los siguientes:

##### Requisitos de pre-recojida

##### Facilidad

1. Coordinación telefonica y/o personal por lo menos 48 horas antes de ser efectuada la recolección.
2. Asignar personal para el viaje.

##### Generador

1. Número de identificación E P A



## Protección Técnica Ecológica

El generador o compañía que tenga actividades relacionadas con desechos peligrosos tiene que tener un número de identificación. En el caso de los generadores de desperdicios peligrosos, estos tienen que tener un número de identificación de "Small Quantity Generators" (SQG) que según definido en la ley. Este número debe de aparecer tanto en los manifestos como en las etiquetas.

### Embalaje

El embalaje del material consiste básicamente en que este esté en óptimas condiciones, que no esté mutilado, corroido, que el tipo de mismo cierre y este sea el adecuado para el material que se va a almacenar.

Si esto no es así se estaría violando la ley y por ende se estaría pagando una multa. Además el uso de un envase inadecuado puede causar una serie de accidentes y contratiempos que pueden evitarse.

### Etiquetas

Todo envase que contenga desperdicios peligrosos debe de estar etiquetado. La rotulación se refiere a etiquetas tales como: Flammables, Corrosive, Poison, ORM-E, ORM-A, etc. Estas etiquetas son el complemento de las etiquetas de Materiales Peligrosos.

### Etiquetas de materiales peligroso

Las etiquetas de materiales peligrosos (Hazardous Waste) son las que contienen la información ofrecida en el manifesto: tales como el número de manifesto, descripción del material, nombre del generador, etc. Todo desperdicio peligroso DEBE tener una etiqueta de "Hazardous Waste", de no ser así sería una violación de la ley.

### Desperdicios No-Peligrosos

Una gran preocupación de parte de las agencias reguladoras en la transportación de desperdicios. Es por esta razón que es importante el que todo desperdicio se encuentre debidamente etiquetado como peligroso o no-peligroso. El transportar drones sin etiquetar puede crear confusión al momento de disponer de los mismos. En caso de cualquier eventualidad en la carretera donde tenga que intervenir alguna autoridad federal o estatal puede ser motivo de multa o confiscación, ya que nosotros intervenimos en la transportación de todos los tipos de desperdicios.



## Protección Técnica Ecológica

Para asegurarnos tanto a nosotros como a la sociedad de que la transportación y disposición de los desperdicios que manejamos es efectuada en forma segura es absolutamente necesario el identificar todo desperdicio transportado aunque este sea no-peligroso. En el caso de los desperdicios no-peligrosos el uso de etiquetas es algo opcional, pero aún así se debe rotular el envase de alguna manera, ya sea escribiendo directamente encima de este o cualquier otra marca. Bajo ningún concepto estos drones pueden tener doble marca; y un dron de "Non-hazardous Waste" no puede tener ninguna otra marca como Poíson, Flammable, etc., de ser así se incurriría en una violación.

El dron que los generadores utilizen para material no peligroso no puede haber sido utilizado para material peligroso anteriormente sin antes haber sido re-acondicionado (Triple Rinse).

Los desperdicios no-peligrosos no requieren el uso de un manifiesto pero es necesario el regular o controlar los viajes que se efectúan, por tal razón, utilizamos el "Waste Transportation Document", esta hoja nos garantiza que el trabajo se efectuó, la cantidad de drones recojidos y nos la provee la firma del generador.

### Requisitos de Transportación

#### Desperdicios Peligrosos

El transportar y disponer desperdicios peligrosos exige una mayor cantidad de requisitos los cuales, garantizan que toda la transportación y disposición de estos se efectuará bajo cumplimiento con todas las agencias reguladoras y que la disposición de estos desperdicios no representará un riesgo a la salud o el ambiente. Entre estos requisitos establecidos se encuentra lo siguiente:

1. Licencia de Calidad Ambiental - Todo vehículo de transporte para desperdicios peligrosos debe tener una licencia (permiso) que le autorize a ser utilizado para dichas funciones. El personal que maneje dicho vehículo debe ser uno debidamente entrenado, que lo capacite para efectuar dicha labor cumpliendo con todos los requisitos y que este pueda responder debidamente a cualquier eventualidad o emergencia.

2. Conocimiento de Ruta y Localización - Es fundamental el tener un buen conocimiento de la ruta a tomar para llegar a determinada planta, ya que, esto agiliza el proceso de recojida y le permite a uno el planificar con anterioridad cualquier eventualidad que pueda surgir. A su vez la facilidad tendrá conocimiento de la ruta tomada, esto nos garantizará el éxito de la operación.

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3. Conocimiento de materiales a ser transportados - El conocer el material a ser transportado es de mucha ayuda, ya que esto facilita el buen manejo del material. El conocer el tipo de material que se va a recojer ofrece al chofer y su ayudante una seguridad al efectuar su labor, ya que, existen determinados químicos que deben ser manejados siguiendo precauciones especiales. Este es el caso de ciertos reactivos y ácidos, aparte de esto existe el peligro de una reacción adversa que pueda provocar un accidente lamentable.

### Pasos a seguir al cargar y descargar materiales peligrosos y no-peligrosos

#### Requisitos antes de abandonar Fuente Generadora

##### 1. Asegurar carga contra cualquier tipo de movimiento

###### a. Barandas protectoras (plataformas)

- 1) Posición correcta
- 2) Aseguradas

##### 2. Revisión del vehículo

3. Asegurarse que no hay ninguna fuente de ignición cerca, llamas o chispas tales como cigarrillos, pipas o fosforos.
4. Asegurarse de que no hayan objetos punzantes que puedan mutilar o ocasionar daño al envase a ser transportado.

El revisar que todo esto este correcto nos ayuda a prevenir accidentes, derrames, goteos, etc., y por ende el caer en violación, lo cual, puede significar una penalidad para todo aquel envuelto en el manejo de dicho desperdicio.

##### 5. El envase a ser transportado debe estar en buenas condiciones, no puede estar mutilado o corroído.

##### 6. Documentación: esta debe estar debidamente cumplimentada y correcta. La información ofrecida en la documentación (manifiesto) debe ser la misma ofrecida en la etiqueta.

#### Documento de Revisión de Carga

El documento de revisión de carga es uno muy sencillo y de fácil entendimiento, el cual, les ayudará a cumplir con todos los requisitos de Transportación y Pre-transportación de una manera eficaz.

Existen dos tipos de documentos uno para desperdicios peligrosos y uno para desperdicios no peligrosos. Cada uno de estos ofrece una serie de items a ser revisados antes de abandonar la Fuente Generadora que se ajusta perfectamente a cada situación mencionada anteriormente.

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Nuestra seguridad, la seguridad del ambiente y de todos en general depende grandemente en la forma en que realizamos nuestra labor. La realización de esto se facilita si seguimos minuciosamente todos los pasos y requisitos de pre-transportación y transportación para nuestro bienestar y el de todos.

# PROTECO

Protección Técnica Ecológica

Adiestramiento

# 2-86

PROTECCION TECNICA ECOLOGICA, CORP.

PROTECO

ADIESTRAMIENTO # 2

REGULACIONES DEL RESOURCE CONSERVATION AND RECOVERY ACT

"RCRA"

RCRA - Resource Conservation and Recovery Act

Es un Acta Federal que le otorga a EPA la autoridad para desarrollar un programa a nivel nacional para regular desperdicios peligrosos desde que estos se generan hasta que se dispone de los mismos. Efectiva en 1976, esta Acta fue establecida para proteger la salud humana y el ambiente del mal manejo de desperdicios peligrosos y así fomentar la conservación de recursos.

FUNCION

Según el subtítulo C de RCRA se demanda o exige que EPA identifique y haga un listado de aquellos desperdicios peligrosos que están sujetos a regulaciones bajo dicho subtítulo. En las secciones 3002 y 3003 se requiere que EPA establezca unos estandars para los generadores y transportadores de desperdicios peligrosos que asegure que todos siguen o mantienen una serie de información y pasos el cual nos garantiza que los desperdicios peligrosos son manejados y dispuestos debidamente.

Estos requisitos e información incluye lo siguiente:

1. un registro de desperdicios (registro de operaciones)
2. Informe de Desperdicios
3. uso de un sistema de manifiestos uniforme
4. uso de etiquetas y envases apropiados
5. envío de desperdicios a facilidades de tratamiento, almacenaje y disposición que tenga permisos otorgados por EPA

## REPASO SOBRE DESPERDICIOS PELIGROSOS

### CRITERIO UTILIZADO PARA DEFINIR DESPERDICIOS PELIGROSOS

Desperdicio Peligroso - Es un desperdicio o una combinación de desperdicios que debido a la cantidad, concentración, toxicidad, corrosividad, mutagenidad o inflamabilidad, o características físicas, químicas o infecciosas puede:

1. causar o contribuir significativamente a incrementar la mortalidad o aumentar las enfermedades que producen daños serios e irreversibles.
2. presentar un peligro potencial a la salud o el ambiente si es tratado indebidamente, almacenado, transportado o dispuesto.

Los Desperdicios Peligrosos están clasificados en grupos. Estos grupos incluyen lo siguiente:

1. Inflamables - son desperdicios sólidos, líquidos o gaseosos y que por una serie de características definidas son capaces de iniciar un fuego fácilmente.

Ej. Metanol, Isopropanol, Acetona, cualquier material sólido impregnado de algún líquido inflamable.

2. Corrosivos - un desperdicio exhibe la característica de corrosivo si posee alguna de las siguientes propiedades:

- a. si es una solución acuosa y tiene un pH menor o igual a 2.
- b. si es un líquido y al cabo de un tiempo corroe el metal en un grado significativo.

Ej. En esta categoría caen los ácidos.

3. Reactivos - Un desperdicio exhibe la característica de reactivo si presenta alguna de las siguientes propiedades:

- a. si libera gases nocivos, como por ejemplo cianuro o sulfuro
- b. si reaccionan con movimientos violentos como por ejemplo nitroglicerina
- c. si reaccionan violentamente con el agua, como por ejemplo ácido sulfúrico.

Su número de identificación es D003.

4. E.P. Tóxico - es aquel desperdicio que después de pasar por una serie de pruebas específicas la extracción resultante de la muestra analizada posee cualquiera de los contaminantes enumerados en la Tabla I en una concentración igual o mayor a las presentadas en la tabla. (Ver Tabla 1 adjunta.)
5. Desperdicios Listados - La reglamentación entiende que existen materiales que dependiendo de su lugar de origen y en algunos casos de experiencias en el pasado, independientemente que estuvieran incluidos o no en las anteriores características mencionadas debe ser parte del grupo de materiales considerados como peligrosos.

Ej. Lodos de Electroplating, Residuos de solventes, freones, alcoles, etc., lodos de limpieza de tanques

## ENTIDADES ENVUELTAS EN ACTIVIDADES DE DESPERDICIOS PELIGROSOS

### GENERADOR - Definición

Un generador se define como cualquier persona cuyos actos o procesos producen desperdicios peligrosos identificados en la parte 261 del 40 CFR.

#### Propósito

Las regulaciones del código federal establecen estándares para generadores de desperdicios peligrosos. Un generador que trata, almacena o dispone de desperdicios sólidos en una facilidad debe cumplir con las secciones relacionadas del código para determinar cuando el desperdicio es o no es peligroso, para obtener un número de identificación de la EPA, para la acumulación de desperdicios peligrosos.

Si no se cumplen los requisitos la persona generadora puede ser sujeta a las penalidades impuestas por el Acta en la sección 3008.

### TRANSPORTADOR - Definición

Es aquella persona encargada de transportar desperdicios peligrosos ya sea por aire, tierra o agua.

## Standars Aplicados a Transportadores de Desperdicios Peligrosos

Las regulaciones del código federal establecen estandars que aplican para personas que transportan desperdicios peligrosos en territorio de los Estados Unidos, si la transportación del mismo requiere un manifiesto según lo establecido por la sección 262 del 40 CFR.

Estas regulaciones conciernen entre otras cosas :

- identificación con etiquetas
- placarding para los camiones
- uso de envases apropiados
- reportar las descargas de desperdicios peligrosos

EPA adoptó estas regulaciones con el propósito de proteger la salud humana y el ambiente en la transportación de desperdicios peligrosos.

Todo transportador debe utilizar un número de identificación otorgado por EPA para poder transportar desperdicios peligrosos.

### FACILIDAD - Definición

Una colección de equipo en un área territorial asociada que sirve para recibir y disponer de desperdicios peligrosos. La facilidad puede dar acceso a varios métodos de disposición.

#### Propósito-

El propósito de la facilidad es establecer unos estandars mínimos nacionales que definan un manejo aceptable de desperdicios peligrosos. Estos estandars aplican a los dueños y operadores de toda facilidad que trate, almacene o disponga de desperdicios peligrosos.

Antes de que el dueño u operador de la facilidad trate, almacene o disponga de cualquier desperdicio peligroso debe obtener un análisis químico y físico detallado de una muestra representativa de ese desperdicio. Este, debe tener por lo menos toda la información necesaria para el tratamiento, almacenaje o disposición de los desperdicios.

El operador de la facilidad debe tomar precauciones para evitar accidentes con desperdicios flamables o la reacción de un reactivo flamable, y se deben tener señales que prevengan del peligro.

## SISTEMA DE MANIFIESTOS

Es un proceso establecido por EPA en el cual las cantidades de desperdicios peligrosos son identificados según son generados, transportados, tratados y dispuestos por una serie de documentos descriptivos y permanentes llamados Manifiesto.

### Requisito General

Un generador que transporta u ofrece transportación, tratamiento, almacenaje o disposición fuera de la planta debe preparar un manifiesto antes de transportar el desperdicio fuera de la misma. Este manifiesto es exigido para cumplir con las reglamentaciones tanto de EPA como de DOT.

### Información Requerida

El manifiesto debe incluir toda la información necesaria para poder tomar acción en caso de cualquier eventualidad.

Entre esta información se incluye el número de identificación otorgado por EPA tanto del generador como del transportador. Además se incluye en el mismo manifiesto una certificación de que el material descrito en el mismo ha sido debidamente clasificado, identificado, empacado y marcado para poder ser transportado.

## ETIQUETAS

### Propósito

El propósito que buscamos al utilizar una identificación para los desperdicios peligrosos, ya sean etiquetas y/o placards es para proteger a los empleados y la seguridad de la empresa.

Los requisitos para cumplir con la identificación de etiquetas, señales y placards son cada vez mas complejas ya que estas áreas están reguladas por mas de una agencia. Cuatro de las agencias reguladoras mas importantes son:

- Departamento de Transportación- DOT
- Agencia de Protección Ambiental - EPA

- Occupational Safety and Health Administration - OSHA
- State Regulatory Agencies

### ETIQUETAS

Existen varios tipos de etiquetas las cuales se usan de acuerdo a la clase de desperdicio que es manejado. Estas varían en color y forma.

Ejemplos de los diferentes tipos de etiquetas que existen son los siguientes:

- Explosivos - Tipo A , B , C
- Inflamables (Flammables)
- No-Inflamables (Non Flammables)
- Corrosivos
- Tóxicos
- Radioactivos
- Etiquetas de Peligro

Dependiendo el estado en que se encuentra el desperdicio, ya sea líquido, sólido o gaseoso es la etiqueta a usarse ya que existen diferentes tipos para cada caso en particular.

TABLA # 1

MAXIMA CONCENTRACION DE CONTAMINANTES PARA  
IDENTIFICAR CARACTERISTICAS DE EP TOXICOS

Número de EPA para desperdicio peligroso	Contaminante	Maxima Concentración (m iligramos por litro)
D004.....	Arsenico.....	5.0
D005.....	Bario.....	100.0
D006.....	Cadm io.....	1.0
D007.....	Crom io.....	5.0
D008.....	Plomo.....	5.0
D009.....	Mercurio.....	0.2
D010.....	Selenio.....	1.0
D011.....	Plata.....	5.0
D012.....	Endrin.....	0.02
D013.....	Lindano.....	0.4

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2000-0404. Expires 7-31-86

<b>UNIFORM HAZARDOUS WASTE MANIFEST</b>		21. Generator's US EPA ID No.		Manifest Document No.		2. Page 1 of		Information in the shaded areas is not required by Federal law.			
		3. Generator's Name and Mailing Address		4. Generator's Phone ( )		A. State Manifest Document Number		B. State Generator's ID			
5. Transporter 1 Company Name		6. US EPA ID Number		C. State Transporter's ID		D. Transporter's Phone					
7. Transporter 2 Company Name		8. US EPA ID Number		E. State Transporter's ID		F. Transporter's Phone					
9. Designated Facility Name and Site Address		10. US EPA ID Number		G. State Facility's ID		H. Facility's Phone					
11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)				12. Containers		13. Total		14. Unit			
				No. Type		Quantity		Wt/Vol			
a. <div style="border: 1px solid black; width: 100px; height: 20px; float: left; margin-right: 5px;"></div>											
b. <div style="border: 1px solid black; width: 100px; height: 20px; float: left; margin-right: 5px;"></div>											
c. <div style="border: 1px solid black; width: 100px; height: 20px; float: left; margin-right: 5px;"></div>											
d. <div style="border: 1px solid black; width: 100px; height: 20px; float: left; margin-right: 5px;"></div>											
J. Additional Descriptions for Materials Listed Above						K. Handling Codes for Wastes Listed Above					
15. Special Handling Instructions and Additional Information											
<p><b>16. GENERATOR'S CERTIFICATION:</b> I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.</p> <p>Unless I am a small quantity generator who has been exempted by statute or regulation from the duty to make a waste minimization certification under Section 3002(b) of RCRA, I also certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment.</p>											
Printed/Typed Name					Signature					Month Day Year	
17. Transporter 1 Acknowledgement of Receipt of Materials											
Printed/Typed Name					Signature					Month Day Year	
18. Transporter 2 Acknowledgement of Receipt of Materials											
Printed/Typed Name					Signature					Month Day Year	
19. Discrepancy Indication Space											
20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.											

GENERATOR

TRANSPORTER

FACILITY

ETIQUETAS DE EPA

PROPER D.O.T. SHIPPING NAME	
<b>ORM-E</b>	
<b>HAZARDOUS WASTE</b>	
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL	
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY	
GENERATOR INFORMATION:	
NAME _____	
ADDRESS _____	
CITY _____	STATE _____ ZIP _____
EPA ID NO. _____	EPA WASTE NO. _____
ACQUITTAL START DATE _____	MANIFEST DOCUMENT NO. _____
<b>HANDLE WITH CARE!</b>	
CONTAINS HAZARDOUS OR TOXIC WASTES	
STYLE W-508	

MADE IN THE U.S.A. CHICAGO, ILL. 60606

ETIQUETAS DE EPA

# HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE OR  
PUBLIC SAFETY AUTHORITY OR THE  
U.S. ENVIRONMENTAL PROTECTION AGENCY.

PROPER OR  
SHIPPING NAME \_\_\_\_\_

UN OR NA \_\_\_\_\_

GENERATOR INFORMATION

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_

ZIP \_\_\_\_\_

EPA

ID NO. \_\_\_\_\_

EPA ID  
WASTE NO. \_\_\_\_\_

ACCUMULATION

DATE \_\_\_\_\_

MANIFEST

DOCUMENT NO. \_\_\_\_\_

## HANDLE WITH CARE!

CONTAINS HAZARDOUS OR TOXIC WASTES

STYLE WMB

LABEL MASTER, CHICAGO, IL 60646

ETIQUETAS DE DOT



ETIQUETAS DE DOT



**CAUTION.....DANGER**

**PCB'S**

**ORM-E**

**CONTAINS  
"RQ" POLYCHLORINATED  
BYPHENYLS**

"RQ" POLYCHLORINATED BYPHENYLS (PCB'S) are a hazardous and toxic material, and their packaging, marking, labeling, storage, transportation and disposal is stringently regulated by the U.S. ENVIRONMENTAL PROTECTION AGENCY in Part 761.40, CFR and the DEPARTMENT OF TRANSPORTATION in Part 172.49, CFR. PCB'S are a suspected "cancer-causing agent" or a "CARCINOGEN". IMPROPER HANDLING or UNNECESSARY EXPOSURE may result in serious health problems. For any type of disposal, contact the nearest EPA Regional Office.

IN THE EVENT OF A RELEASE OR SPILL, NOTIFY AS SOON AS POSSIBLE: U.S. COAST GUARD NATIONAL RESPONSE CENTER: 800-424-8602.

ALSO COMPANY  
CONTACT TELEPHONE

TAKE ALL NECESSARY PRECAUTIONS WHEN HANDLING OR TRANSPORTING THIS EQUIPMENT OR CONTAINER. MINIMIZE POSSIBLE EXPOSURE BY USING THE RECOMMENDED SAFETY PROCEDURES AND EQUIPMENT.

© 1981 HAZARDOUS MATERIALS PUBLISHING CO. KUTZTOWN, PA. 19530

**CAUTION**  
**CANCER SUSPECT AGENT**

THIS PRODUCT IS A KNOWN OR SUSPECTED "CARCINOGEN"  
CONTAINS \_\_\_\_\_

**CANCER HAZARD**

DO NOT OPEN OR HANDLE WITHOUT USING  
RECOMMENDED SAFETY PROCEDURES & EQUIPMENT

FOR  
INFORMATION  
CONTACT

COMPANY \_\_\_\_\_

TELEPHONE \_\_\_\_\_

© 1981 HAZARDOUS MATERIALS PUBLISHING CO. KUTZTOWN, PA. 19530

Esta etiqueta se utiliza para DESPERDICIOS NO PELIGROSOS tanto líquidos como sólidos.  
La información que el generador y transportador provee en la misma es OPCIONAL.

**NON-  
HAZARDOUS  
WASTE**

OPTIONAL INFORMATION:

SHIPPER \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY, STATE, ZIP \_\_\_\_\_

CONTENTS \_\_\_\_\_

**NON-HAZARDOUS WASTE**

GWM

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Protección Técnica Ecológica

Adiestramiento # 3

Tema: El Manifiesto y el Material Safety Data Sheet  
(Papeles para el Embarque de Desperdicios Peligrosos)

## I - Introducción

### A - Sistema de Manifiestos

1- definición

2- propósito

## II - Agencias Reguladoras

A - DOT - (Department of Transportation)

B - EPA - (Environmental Protection Agency)

C - OSHA (Occupational Safety and Health Administration)

## III - Requisitos del Manifiesto

### A - Información Requerida

1 - Sección del Generador

a - Datos del Generador

2 - Sección del Transportador

a - Datos del Transportador

3 - Sección de la Facilidad

a - Datos de la Facilidad

4 - Identificación del Desperdicio

5 - "RQ" - (Reportable Quantity)

(cont.) . . .

C- Etiquetas Requeridas

1- Relación con el Manifiesto

IV- Material Safety Data Sheet

A- Información ofrecida en el "MSDS"

1- Protección del Ambiente

2- Protección de la Salud

# PROTECO

## Protección Técnica Ecológica

### LISTA DE ITEMS A SER REVISADOS ANTES DE LA TRANSPORTACION DE DESPERDICIOS PELIGROSOS

Compañía: \_\_\_\_\_ Fecha: \_\_\_\_\_

#### I. Materiales peligrosos

##### A. Manifiesto

1. Document no. ( )
2. EPA ID No. (generador, transportador, facilidad) ( )
3. Información sobre desperdicio ( )
  - a. Shipping name, hazard class, UN Number ( )
  - b. Net quantity, units (cantidad, unidades) ( )
  - c. No. containers (drones, tanques, etc.) ( )
4. Generator signature (firma encargado planta) ( )
5. Transporter no. 1 signature (firma conductor) ( )
6. Copias de manifiesto (dejar últimas dos solamente) ( )

##### B. Materiales

1. Número de containers (drones, tanques, etc.) ( )
2. Etiquetas (hazardous waste labels) ( )
3. Marcas (flammable, poison, etc.) ( )
- \*4. Revisar si los drones tienen doble marca (si la etiqueta dice una cosa y dron dice otra) no aceptarlo si no se borra la doble marca. ( )
5. Condición del container: ( )
  - a. excelente aceptado: \_\_\_\_\_
  - b. bueno aceptado: \_\_\_\_\_
  - c. malo no aceptado: \_\_\_\_\_Total : \_\_\_\_\_
6. Placards: no salir de la compañía si el camión no tiene las 4 placards con el número requerido (UN Number en el Manifiesto) ( )
7. Asegurar la carga ( )

\_\_\_\_\_  
Firma conductor

\_\_\_\_\_  
Fecha

# PROTECO

## Protección Técnica Ecológica

### LISTA DE ITEMS A SER REVISADOS ANTES DE LA TRANSPORTACION DE DESPERDICIOS NO PELIGROSOS

Compañía: \_\_\_\_\_

Fecha: \_\_\_\_\_

#### I. Materiales no peligrosos

##### A. Documento de transportación

1. Número de "containers" (drones, tanques, etc.) ( )
2. Descripción del material ( )
3. Cantidad del material (gals, lbs, etc.) ( )
4. Firma del encargado

##### B. Materiales

1. Número de "containers" (drones, tanques, etc.) ( )
2. Etiquetas (non hazardous) no es requerido ( )
3. Marcas
4. Identificación del generador y contenido del "container" si no tiene etiquetas (pintado, escrito escrito sobre el dron, etc.) ( )
- \*5. Revisar doble marca en los "containers"; si es así, borrar doble marca o no aceptarlos. ( )
6. Condición del "container":
  - a. excelente aceptado: \_\_\_\_\_
  - b. bueno aceptado: \_\_\_\_\_
  - c. malo no aceptado: \_\_\_\_\_

Total : \_\_\_\_\_

7. Revisar carga ( )

\_\_\_\_\_  
Firma conductor

\_\_\_\_\_  
Fecha

# PROTECO

Protección Técnica Ecológica

Adiestramiento

# 3-86



Protección Técnica Ecológica

## Programa de Adiestramientos Adiestramiento #3

Tema: El Manifiesto y El Material Safety Data Sheet  
(Papeles para el embarque de Desperdicios Peligrosos)

### Introducción

Los papeles o documentos para el embarque de materiales peligrosos nos proveen la información necesaria la cual permite que cualquiera que entre en contacto con los materiales durante la transportación o en una situación de emergencia puedan tomar las medidas necesarias al cargar, transportar o descarga materiales peligrosos.

Cuando una persona prepara un cargamento de materiales peligrosos para la transportación todas las regulaciones, tanto estatales como federales le requieren un documento que cubra el embarque. Siempre que este embarque sea de material peligroso y no sea desperdicio peligroso puede estar acompañado de un "invoice" (factura), factura de embarque o cualquier otro documento. Cuando dicho material de embarque es un desperdicio peligroso debe estar acompañado de un manifiesto, esto es así ya que este es mas completo y cumple con las regulaciones impuestas de todas las agencias envueltas.

## El Sistema de Manifiesto

### Definición y Propósito

Se define como un proceso en el cual los desperdicios peligrosos son registrados por medio de un documento permanente y descriptivo desde que estos son producidos hasta su tratamiento y disposición final.

### Agencias Reguladoras

El manifiesto uniforme de desperdicios peligrosos ha sido desarrollado en conjunto por la Agencia de Protección Ambiental Federal (U.S.E.P.A.) y por el Departamento de Transportación Federal (U.S.D.O.T.) para controlar el flujo de desperdicios peligrosos desde que se generan hasta que se disponen.

En Puerto Rico la Junta de Calidad Ambiental (E.Q.B.) ha adaptado el modelo de este manifiesto para uso dentro de territorio nacional. Este trabajo en conjunto de EPA y D.O.T. ha sido una ardua labor con el cual se pretende tener un sistema que sea igual para todos los estados.

En el pasado cada estado tenía un sistema de manifiesto individual el cual creaba una serie de discrepancias cuando dicho embarque llegaba a otro territorio.

Si nos fijamos en una copia del manifiesto hay secciones que pertenecen a D.O.T. y otras que pertenecen a EPA.

### Secciones Reguladas por EPA

Secciones : 1, 6, 10, I, K, 16, 17, 18, 19, 20

### Secciones Reguladas por DOT

Secciones : 11, 12, 13, 14, J, 15

### Areas Sombreadas (Shaded Areas)

Esta sección es básicamente para la JCA y/o cualquier otra agencia estatal concerniente (caso de los estados).

## OSHA - (Occupational Safety and Health Administration)

El Material Safety Data Sheet (MSDS) es requerido por DOT y OSHA. DOT tiene a cargo lo concerniente a la transportación y almacenaje. OSHA tiene a cargo lo relacionado al trabajo, esta agencia se envuelve en la seguridad asociada al trabajo.

### Requisitos del Manifiesto

Información Requerida - Se requiere completar debidamente toda la información en un manifiesto. Omisiones, codificaciones falsas o ilegibilidad es considerado una violación.

### Sección del Generador

Todos los generadores son responsables bajo la Junta de Calidad Ambiental (EQB) y la ley federal por la identificación adecuada, el uso de etiquetas, el manifiesto y la disposición final de todos los desperdicios que estos generen.

### Datos del Generador

- El generador debe firmar la certificación del manifiesto a mano y obtener la firma del transportador y la fecha en que se aceptó el material. Además, debe retener la copia del manifiesto designada para el generador.

- Todo generador de desperdicios peligrosos debe obtener un número de identificación otorgado por E.P.A. Este número tiene que ser incluido en el manifiesto en la sección designada para el mismo. Existen casos de generadores de pequeñas cantidades (generadores de menos de 1,000 kg x mes) a estos no se les requiere un número de identificación de EPA. Usualmente, se les designa como "Small Quantity Generators" (SQG).

- Además del número de identificación del generador, el manifiesto debe incluir el número del manifiesto. Este número generalmente sigue una secuencia de manifiestos anteriores expedidos en la planta.

- El nombre, la dirección y el número telefónico del generador son incluidos en el manifiesto. Estos datos son sumamente importantes en caso de cualquier eventualidad o emergencia.

### Sección del Transportador

El transportador no puede aceptar material peligroso de un generador si este no viene acompañado de un manifiesto firmado por dicho generador.

El transportador debe tener conocimiento del material peligroso que acepta antes de firmar el manifiesto, y cerciorarse de que el material que está aceptando es aquel descrito en el manifiesto. El transportador retiene una copia del manifiesto designada para él (Transporter's Copy).

### Datos del Transportador

Dentro de la información ofrecida en el manifiesto el transportador incluye los siguientes datos:

- el nombre de la compañía transportadora
- el número de identificación como transportadores otorgados por EPA (este es un requisito tanto para el generador, transportador y facilidad)
- el número telefónico del transportador
- firma del camionero que recibe el material
- número de permiso local que le otorga la Junta de Calidad Ambiental, el cual hay que renovar cada año.
- también se requiere # de licencia de vehículo (tablilla)

## Sección de la Facilidad

Toda facilidad de tratamiento, almacenaje y disposición de desperdicios peligrosos debe tener un permiso de la EPA para poder manejar los desperdicios.

## Datos de la Facilidad

La información ofrecida en el manifiesto debe incluir lo siguiente:

- el nombre y dirección de la Facilidad
- el teléfono
- el dueño u operador de la facilidad debe firmar el manifiesto donde se certifica el recibo del material

## Identificación de los Desperdicios

En esta sección del manifiesto se describe el desperdicio. Como se menciona en el adiestramiento anterior estos están clasificados en 5 categorías. En el manifiesto la descripción del desperdicio puede referirse a cualquiera de estas categorías.

Ejemplo :

- Inflamable (Flammable) - se identifican en el manifiesto como Flammable (liquid or solid) N.O.S.

- Corrosivos (Corrosives) se identifican como Corrosive Material N.O.S.

Las siglas N.O.S. se refieren a "Not Otherwise Specified". Cuando estas siglas aparecen en la sección que identifica el material se debe completar la sección J que pide descripciones adicionales para los materiales identificados en la sección anterior.

Cuando las siglas N.O.S. no aparecen en la sección que identifica el desperdicio entonces la descripción del mismo es mas específica y no necesita descripciones adicionales.

"RQ" - Reportable Quantity (Cantidad Reportable)

Siempre que un embarque de material peligroso exceda los límites de la cantidad

reportable debe incluir el "RQ" en el manifiesto.

El "RQ" surge como medida de las regulaciones de DOT. Es lo que se conoce como la "Cantidad Reportable" en caso de un derrame. Si la cantidad que se derrama es igual o mayor que la cantidad que aparece reportada en la Tabla de DOT se debe avisar a las autoridades pertinentes. Por otro lado, si la cantidad derramada es menor que el "RQ" entonces se procede a recoger lo derramado tomando las precauciones necesarias.

### Ejemplo:

Si se transporta, digamos 8,000 lbs. de Acetona y surge un derrame igual o mayor de 5,000 lbs. hay que reportar dicho derrame inmediatamente a las agencias pertinentes, ya que el "RQ" para acetona es de 5,000 lbs.

Todo estado de emergencia surgido como consecuencia de un derrame que excede los límites del "RQ" debe ser reportado inmediatamente a:

National Response Center  
tel - (800) 424-8802

Si dicho derrame es menor que el "RQ" para determinado material, entonces podemos hacer uso del Material Safety Data Sheet (MSDS), el cual nos provee toda la información necesaria para bregar con una eventualidad de esta índole.

### Material Safety Data Sheet (MSDS)

Toda planta manufacturadora, importadora o todo aquel que bregue de una u otra forma con sustancias peligrosas debe desarrollar u obtener del manufacturador un Material Safety Data Sheet (MSDS). Este MSDS debe proveer toda la información necesaria para poder manejar dichas sustancias en el trabajo o cualquier caso de emergencia.

### Requisitos

Cada "Material Safety Data Sheet" debe estar en Inglés y debe contener por lo menos la siguiente información:

- 1- identificación del reactivo químico

2. ingredientes peligrosos que contiene
3. datos físicos
4. datos sobre fuego y explosión
5. peligros que puede causar a la salud
6. datos de reactividad
7. procedimientos en casos de derrame o  
liqueo
8. protección especial
9. precauciones especiales

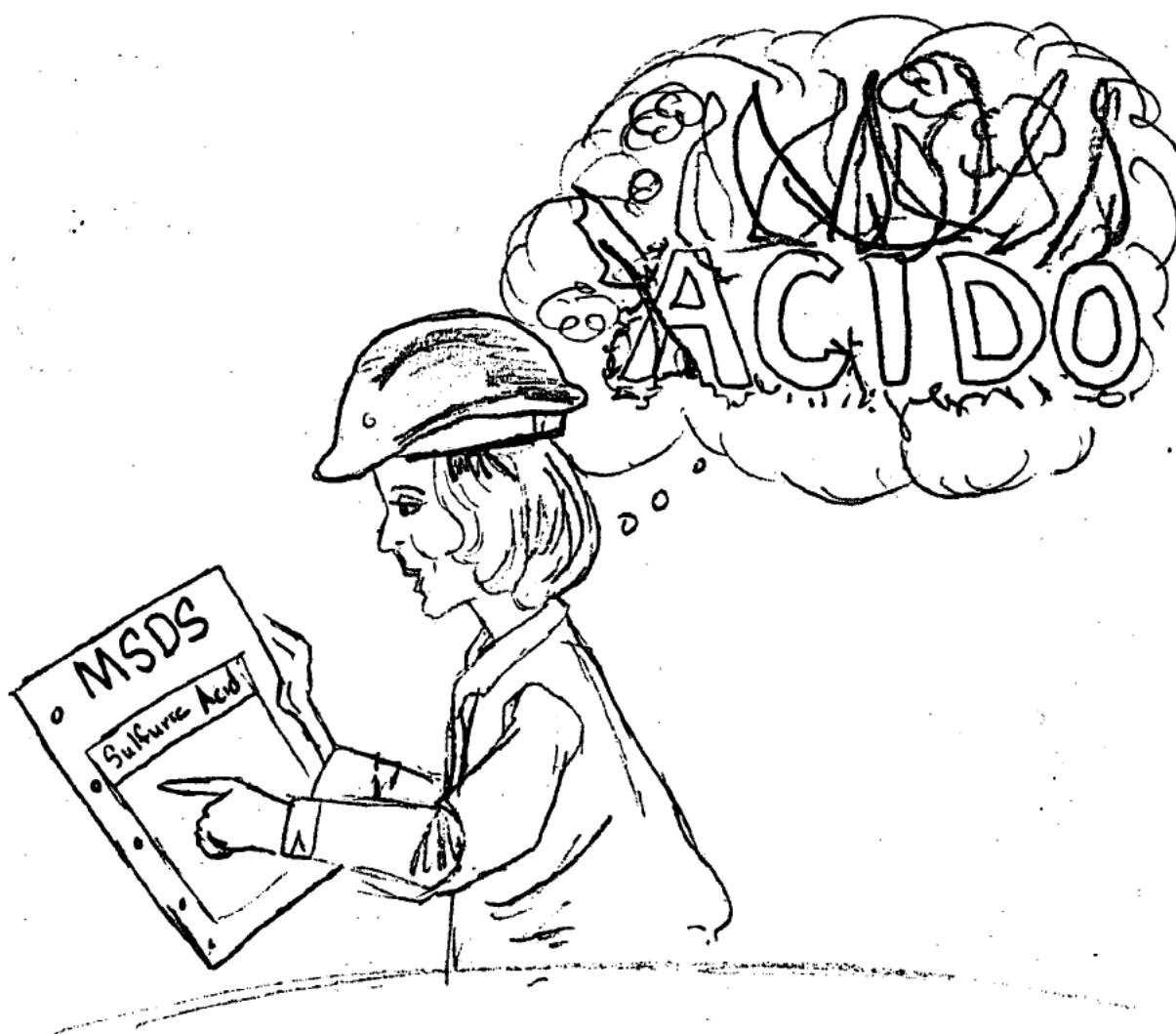
Toda esta información es sumamente útil cuando se manejan sustancias peligrosas ya que el mal manejo de los mismos puede ocasionar daños irreversibles tanto a la compañía como al individuo. Este sistema no funcionaría si los envases no están debidamente rotulados.

El MSDS será requerido para el embarque de todo material o desperdicio peligroso.

El proveer los papeles o documentos de embarque necesarios pone en alerta a cualquier persona que este en contacto con sustancias peligrosas del riesgo o peligro potencial que presenta el transportar los mismos. También les provee toda esa información crucial que simplemente le ayudará a protegerse a si mismo y a sus semejantes contra los riesgos que presenta un estado de emergencia con sust. peligrosas o sencillamente el rutinario ciclo de transportación

# Como usar el Material Safety Data Sheet MSDS

\* El MSDS para cada reactivo químico en tu área de trabajo te dira como usar, manejar, y almacenar los químicos de una manera segura. Cada MSDS te puede parecer un poco diferente pero cada uno contiene básicamente la misma información, la cual es indudablemente muy útil para todos aquellos que trabajan con sustancias peligrosas\*



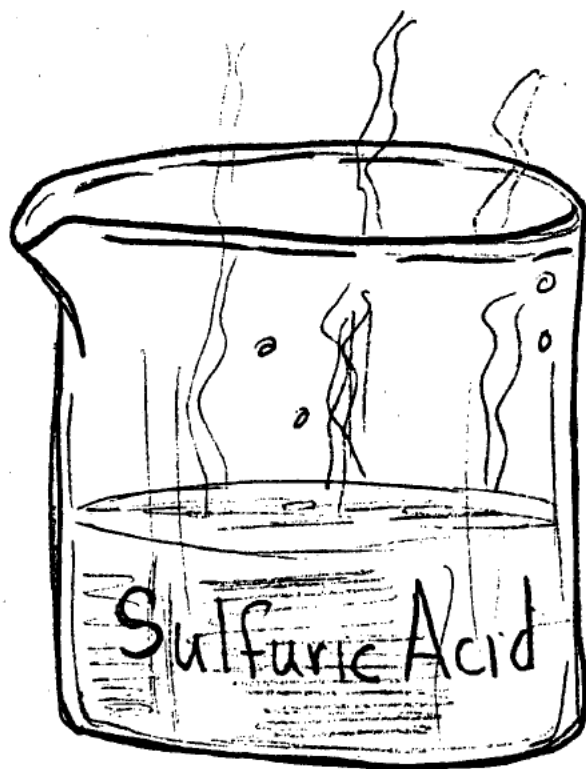
## Identificación del Reactivo Químico

La primera sección del MSDS te ayuda a identificar dicho químico. Enumera el nombre del reactivo, da su nombre comercial y el manufacturador químico. Esta sección también puede proveer un número telefónico de emergencia



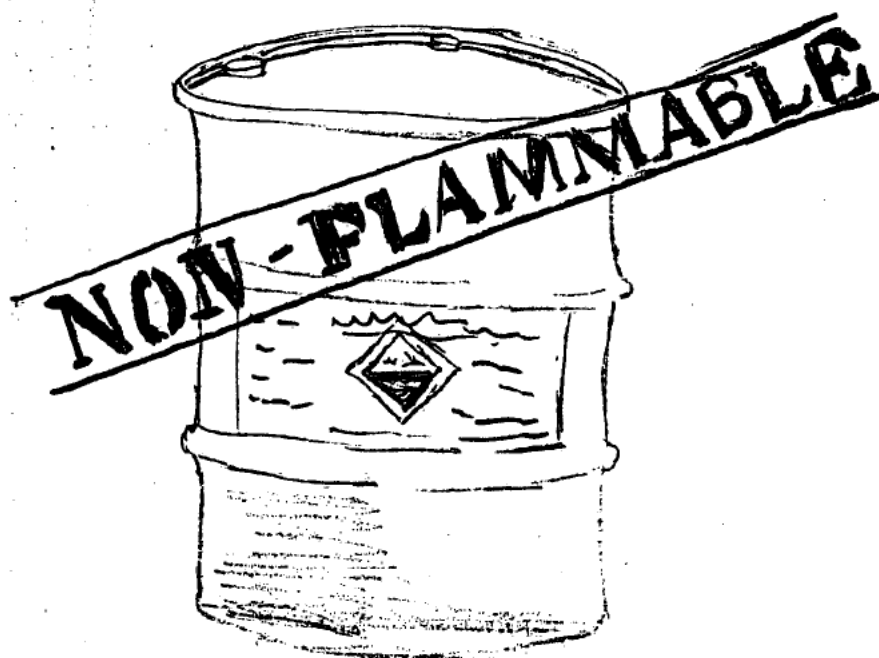
## Ingredientes Peligrosos

Esta sección identifica lo que el reactivo químico contiene y puede afectarte. También identifica la máxima concentración del químico al cual puedes estar expuesto, conocido como límite de exposición permisible (PEL). Estos límites de exposición segura usualmente se calculan para exposiciones promedios de una jornada típica de trabajo.



### Datos Físicos

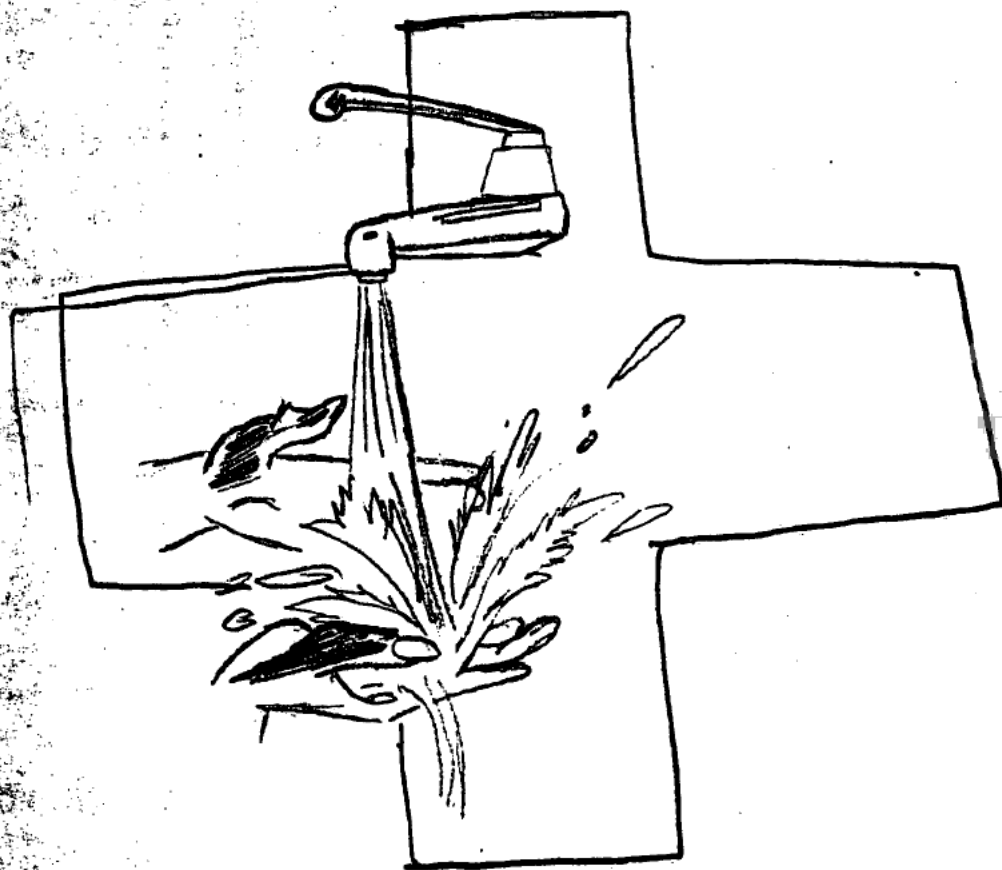
Esta sección describe la apariencia, olor y otras características del reactivo químico y el porcentaje volátil (es la cantidad del reactivo que se evapora a temperatura ambiente).



## Datos sobre Fuego y Explosión

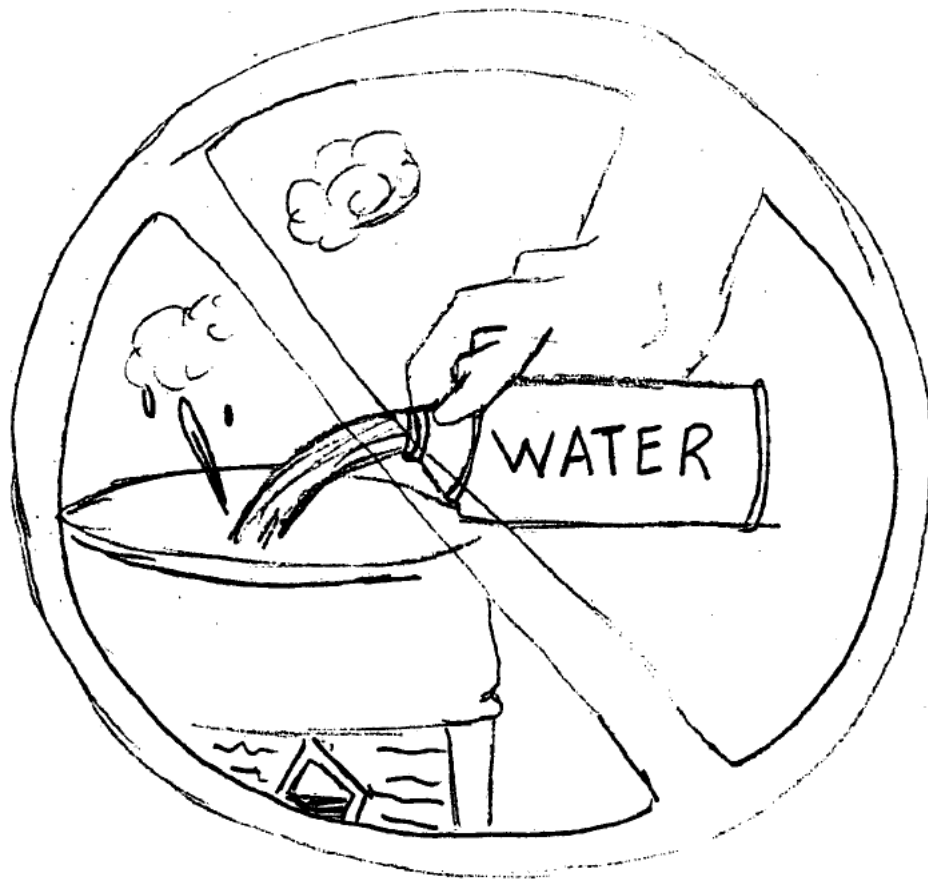
Aquí puedes encontrar a que temperatura los reactivos químicos se encienden, a esto se le llama "flash point". Si un reactivo es inflamable se enciende a una temperatura menor de  $100^{\circ}\text{F}$ . Si es combustible se enciende a una temperatura de  $100^{\circ}\text{F}$  o mas.

Esta sección también puede enumerar los medios de extinción que pueden apagar un fuego de una manera segura, tales como aerosol de agua, foam, u otro tipo de extintor de incendio.



## Peligros que puede causar a la Salud

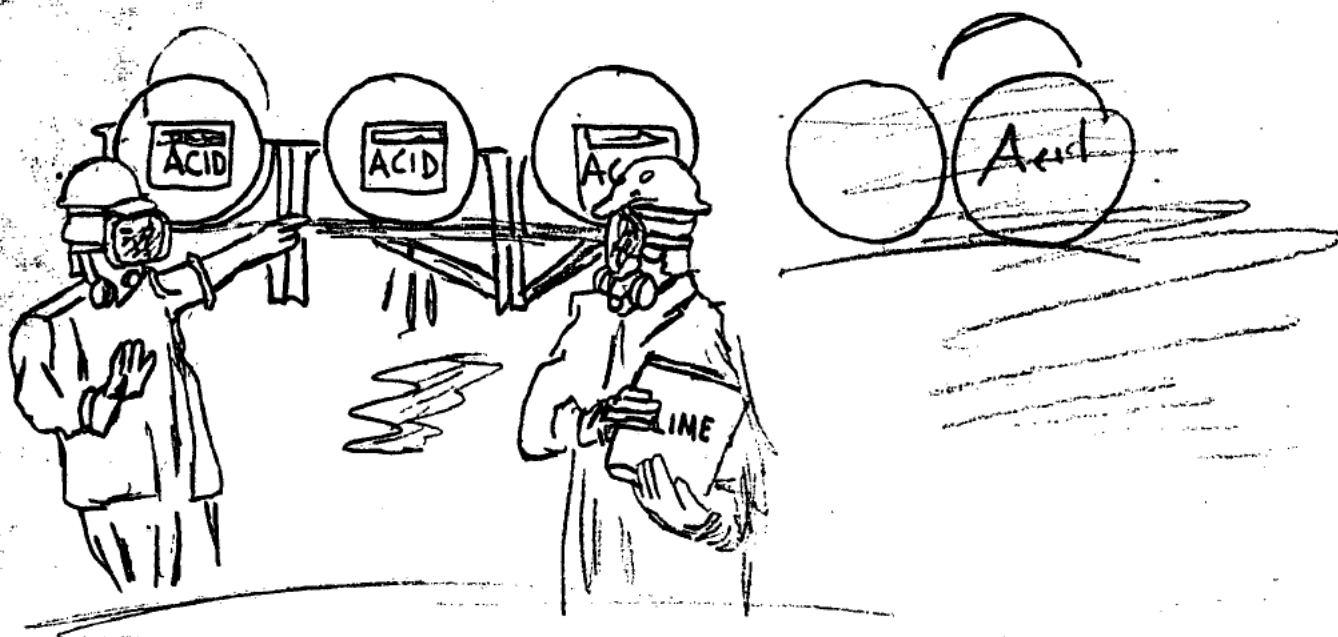
Esta sección identifica los síntomas provocados por la sobre-exposición tales como picazón, quemazón, dolor de cabeza o mareos. También nos proporciona los procedimientos de primeros auxilios y de emergencia a seguir en caso de una sobre-exposición tales como enjuague con agua corriente por 15 minutos. También puede especificar ciertas condiciones clínicas que pueden ser agravadas debido a la sobre-exposición al reactivo químico.



## Datos de Reactividad

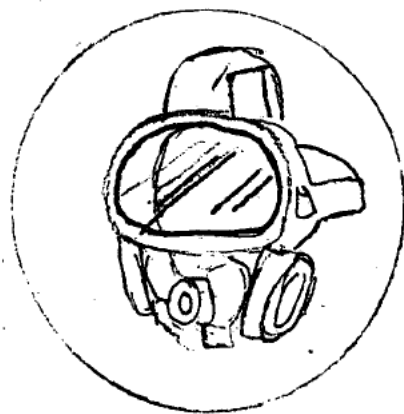
Aquí encontraras si los químicos "reaccionan" con materiales o por condiciones. La incompatibilidad - enumera los materiales con los que puede reaccionar, tales como agua u otros químicos.

La inestabilidad - enumera las condiciones ambientales, tales como calor o luz solar directa que puede ocasionar una reacción peligrosa.



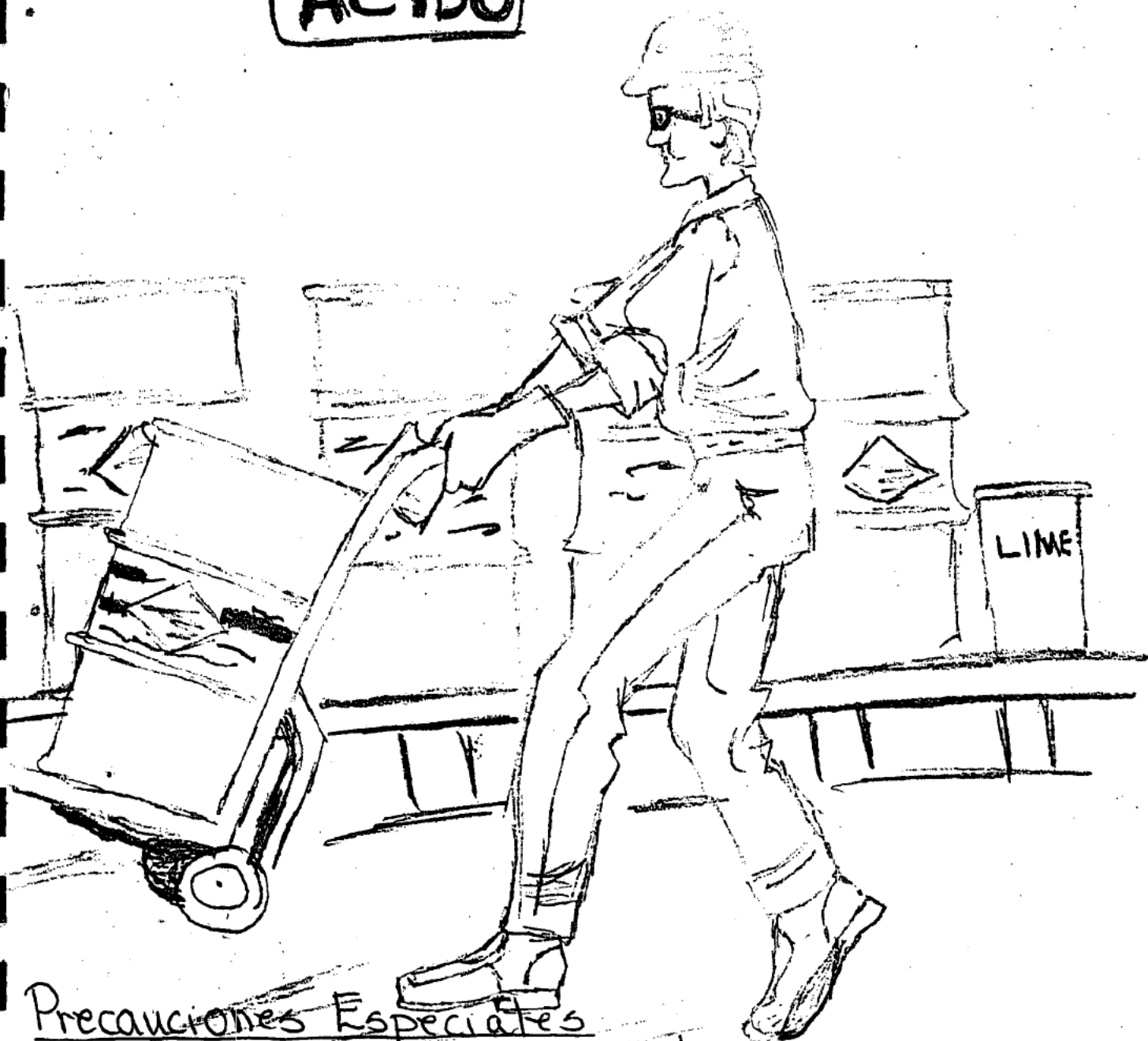
## Procedimientos en Caso de Derrame o Liqueo

Esta sección nos dice que hacer para limpiar un derrame o liqueo accidental. No importa que tipo de químico sea debes notificar supervisor inmediatamente. Antes de limpiar un derrame químico puedes necesitar protección especial como: protección respiratoria, guantes, gafas de seguridad o ropa que te brinde protección como por ejemplo "coveralls". Esta sección también puede incluir notas sobre como disponer de un reactivo químico con seguridad.



## Protección Especial

Aquí encontraras un listado de equipo de protección personal (respiradores, guantes protección para los ojos) que necesitas para trabajar con un máximo grado de seguridad cuando se trata de reactivos químicos. Si necesitas protección especial esta sección te enumerará el tipo de protección específica que es recomendada, tales como una careta respiratoria completa, guantes de gomas etc...



### Precauciones Especiales

Esta sección enumera las precauciones especiales que debes seguir para manejar un reactivo químico. Este también puede incluir que tener cerca en caso de derrame y los letreros específicos que debes tener en el área para advertir del peligro. Esta sección puede proveer información no cubierta en otras secciones del MSDS.

Tabla # I - Tipos de Envases

Codificación	Descripción del envase
DM	dron de metal, barriles
DF	panel de fibra, dron o barril plástico
TT	tanques de carga (tanques de camiones)
DT	camión de tumba
CM	cajas de metal, cartones, estuches
DW	drones de madera o barriles
TP	tanques portátiles
TC	tanques de carro
CY	cilindros
CW	cajas plásticas o de fibra, (cartones)

Tabla # 2 - Unidades de Medida

Codificación	Descripción
G	galones
L	litros
P	libras (pounds)
K	kilogramos
T	Toneladas (2,000 libras)
M	Toneladas métricas (1,000 kg)
Y	yardas cúbicas
N	metros cúbicos

# PROTECO

## Protección Técnica Ecológica

### ADIESTRAMIENTO #4-86

Manejo, Cargando y descargando material peligroso y no-peligroso

#### I. Introducción:

A. Importancia del buen manejo de desperdicios

#### II. Requisitos de pre-transportación (generadores)

A. Desperdicios peligrosos

1. Número de E P A
2. Empacado
3. Rotulado
4. Etiquetas

B. Desperdicios no peligrosos

1. Empacado
2. Etiquetas (Opcional)

#### III. Requisitos de transportación

A. Desperdicios peligrosos

1. Número de E P A
2. Licencia de calidad ambiental
  - a. vehículos autorizados
  - b. personal entrenado

3. Conocimiento de ruta y localización de la compañía
4. Conocimiento de materiales a ser transportados

B. Desperdicios no-peligrosos

1. Licencia de la Junta de Calidad Ambiental
  - a. vehículos autorizados
  - b. personal entrenado
2. "Este Transportation Document"

# PROVECO

## Protección Técnica Ecológica

### IV. Pasos a seguir al cargar y descargar materiales peligrosos y no peligrosos

- A. Segurar carga
- B. Condición de envase
- C. Revisión del vehículo
- D. Documentación correcta

#### V. Documentos de revisión de carga

##### A. Desperdicios no peligrosos

- 1. Documento de transportación
- 2. Materiales

##### B. Desperdicios peligrosos

- 1. Manifiesto
- 2. Materiales

APPENDIX H.2

## HAZARDOUS WASTE ORIENTATION MEETING OUTLINE

### I. Introduction

- A. Welcome participants
- B. Introduce orientation program
- C. Explain reasons for this training
  - 1. Familiarization with facility's hazardous waste management program.
  - 2. Inform participants of their responsibilities.
  - 3. Prepare participants to respond effectively to emergencies.

### II. General Discussion of RCRA Regulations

- A. Review the criteria of hazardous waste
  - 1. Toxic - poisonous
  - 2. Ignitable - fire hazard
  - 3. Reactive - explosive
  - 4. Corrosive - high acid or alkaline - can eat through containers
- B. Explain the role of this facility
  - 1. Generating facility - produces hazardous waste - explain that these wastes are not limited to production processes. Hazardous waste can be a by-product of a maintenance activity or can be a discovery in a warehouse or distribution center.
  - 2. Storage facility - holds hazardous waste.
  - 3. Treatment facility - processes hazardous waste to make it less or non-hazardous.
  - 4. Disposal facility - intentionally placing hazardous waste into or on land or water.
- C. List and describe the specific hazardous wastes managed in this facility
- D. Answer questions

### III. Specific Discussion of RCRA Regulation

- A. Identification of hazardous waste
  - 1. Exhibits any of the following characteristics: (See 40 CFR Part 261 sub-part C)
    - a. Ignitable
    - b. Corrosive
    - c. Reactive
    - d. Toxic

2. The waste has been found to be fatal to human (40 CFR Part 261.11(a)(2))
  3. The waste is listed or constituents of the waste is listed in Appendix VIII of 40 CFR Part 261.
  4. Explain any additional state requirements.
- B. Packaging hazardous waste prior to shipping - requirements contained in 49 CFR Part 178. Explain any state requirements
- C. Labeling, marking, and placarding requirements contained in 49 CFR Part 172. Explain any state requirements
- D. Manifesting
1. Show and explain specific manifest form(s) to be used at this facility. Discuss all information that must be entered and where that information is found.
  2. Review the number of copies to be made out.
    - a. Generator - 2 copies
    - b. Each transporter - 1 copy
    - c. Facility hazardous waste is being shipped - 2 copies
    - d. State - 1 copy from generator
    - e. State - 1 copy from TSD facility
  3. Explain generator's actions if manifest is not received back within 35 days.
  4. Explain generator's actions if manifest is not received back within 45 days.
  5. Explain TSD actions if unmanifested waste is received.
- E. Review briefly the requirements of a Transporter

IV. Facility Contingency Plan.

- A. Explain actions of facility personnel when there is a:
1. fire
  2. explosion
  3. groundwater contamination
  4. shutdown of operations
  5. release of hazardous waste
- B. Explain how plan will be implemented
- C. Describe arrangements agreed to with:

1. police
2. fire department
3. hospitals
4. contractors
5. state and local emergency response teams

D. List all emergency equipment (where applicable)

1. fire extinguisher equipment
2. spill control equipment - explain what these are
3. communication and alarm systems - explain that these are
4. decontamination equipment - explain what these are

E. Describe evacuation procedure

1. under what conditions to evacuate
2. signal to begin evacuation
3. evacuation routes
4. alternate routes

F. Designate emergency coordinators

1. who are they
2. recap major responsibilities

H. Identify the emergency and monitoring equipment/systems used in the facility and explain how they operate. Include, where applicable:

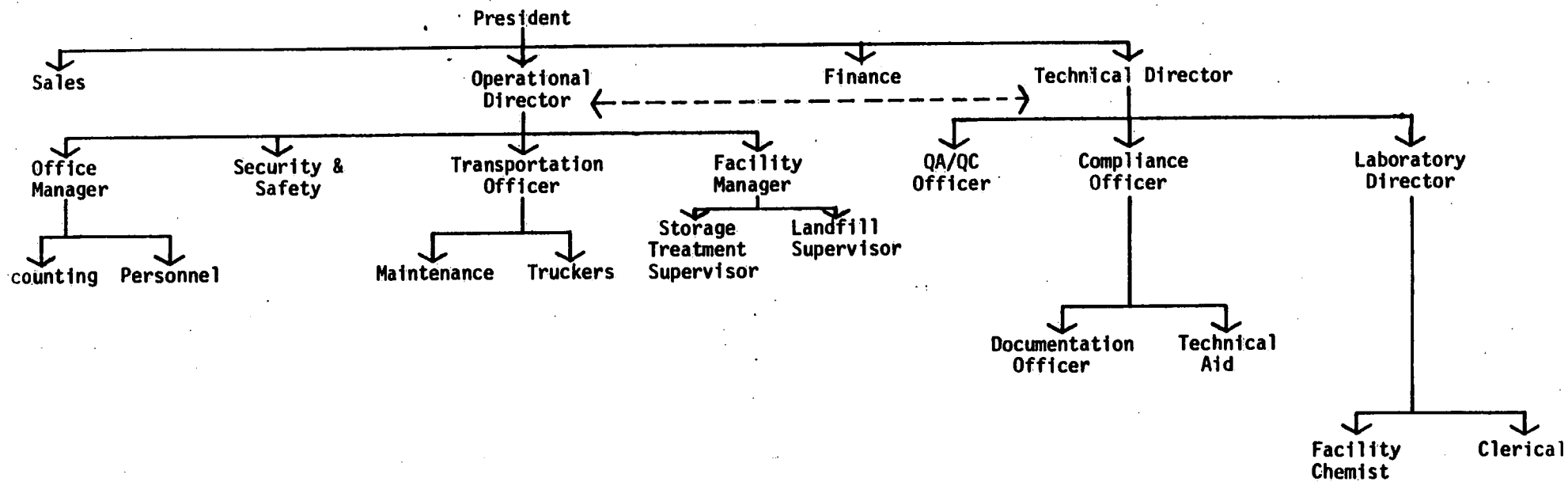
1. Internal communication or alarm systems to provide immediate emergency instruction to personnel.
2. Telephone or radio communication to summon assistance from off-site.
3. Portable fire extinguishers and fire control equipment.
4. Spill control equipment.
5. Decontamination equipment.
6. Water at adequate volume and pressure
7. Automatic waste feed cut-off system
  - a. discuss parameters for cut-off
8. Safety equipment
9. Security devices

I. For the equipment/systems utilized explain that there are procedures for:

1. Using
2. Inspecting
3. Repairing
4. Replacing
5. Explain where these procedures are found

J. Answer questions

**APPENDIX H-3**  
**JOB TITLES AND DESCRIPTIONS**



# PROTECO

## Protección Técnica Ecológica

### OPERATIONAL DIRECTOR

#### Reports to President

Qualifications: BS in Engineering; administration experience; personnel and production expertise; hazardous material training; familiar with EPA, EQB, RCRA and DOT regulations.

#### Duties

Emergency response availability on a 24 hour, 7 week day basis to respond to incidents involving an emergency in site.

Supervision of all Departments. Liaison with local, professional and civic entities. Sales and marketing liaison. Responsible for accounting and administrative functions. Responsible for Personnel regulations.

Develop expertise knowledge of all local and Federal rules, laws and regulations for hazardous, and non hazardous waste, transportation, disposal and related areas.

Familiar with all operation functions, layouts, road accesses, and contingency plan. Responsible for achieving objectives. Responsible for cost reduction. Any special duty as assigned by President.

# PROTECO

Protección Técnica Ecológica

## SECURITY AND SAFETY

### Reports to Operational Director

#### Qualifications:

Minimum high school  
Driver license  
Hazardous material training  
Familiar with OSHA regulations

#### Duties

- Make inspection of all facility security measures, i.e., fences, gates, communication equipment.
- Monthly inspection of first aid stations
- Weekly inspection of fire extinguishers and fire fighting apparatus.
- Weekly general inspection
- Make or assign repair and correction of deficiencies found.
- Hazardous material training
- Be familiar with layout, road accesses and contingency plan.
- Supervise gate guards and assign duties.
- Any special duty assigned by the Operational Director.

**PROTECO**

**Protección Técnica Ecológica**

**OFFICE MANAGER**

**Reports to Operational Director**

**Qualifications:**

**Business Administration Background  
Ability to supervise**

**Duties**

- Responsible as guardian of petty cash**
- Responsible to have ready for Operational Director of accounts payable and accounts receivable, payroll, personnel.**
- Responsible for purchasing procedures**
- Responsible for personnel regulations**

# PROTECO

## Protección Técnica Ecológica

### TRANSPORTATION SUPERVISOR

Reports to Facility Manager

Qualifications: HS graduate or equivalent. Hazardous waste training. Understanding D. OT regulations Heavy equipment. Driver license.

### Duties

Direct supervision of Trucker and operators. In charge of obtaining proper maintainance of truck and equipment.

Responsable to follow schedule.

Planning with facilities manager. The equipment and personnel to perform the asigned work. Instruct personnel on handling emergency on the road.

Advise facility manager in the event of unsafe conditions.

Primary objective is to facilitate the safe transfer or disposal of hazardous and non hazardous material.

Assist in the decontamination of equipment emerging from the contaminated area.

# PROTECO

## Protección Técnica Ecológica

### FACILITY MANAGER

#### Report to Operational Director

Qualifications: BS in Engineering. Personnel supervision. Hazardous material training. Familiar with EPA, EQB, RCRA regulations.

#### Duties

Supervise all activities of disposal, processing of hazardous and non hazardous material. Coordinate all safety activities with the safety coordinator to establish and adjust, as necessary, the level of safety precautions appropriate to the personnel working in hazardous waste site. Direct workers to conduct their work in accordance with the work plans and safety rules.

Establish procedures and instruct personnel as to the handling of materials, transportation procedures, proper disposal and decontamination of equipment.

Maintain compliance for safety cost control and reduction program for disposal activities.

Coordinate with Compliance and Sales in regards to equipment and personnel requirements. 1. maintain facility operation. Familiarity with operation layout, road accesses, and contingency plan.

Maintain programs, plans, recordkeeping, etc. for compliance with all local, state and federal regulations. Any official duty as assigned by Operational Director.

**PROTECO**

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**STORAGE/TREATMENT**

**SUPERVISOR**

**Reports to Facility Manager**

Qualifications : HS graduate. Hazardous waste training.

Duties

Provide day to day supervision and direction to the hourly employees operating the drum storage, tank farm and stabilization/fixation.

Insure all employees are properly trained in both in operation and safety procedures. Insure that all employees are wearing the proper safety equipment al all times.

Understand all emergency and contingency plans and be sure employees understand them.

Recomend changes in operations and procedures to improve productivity and efficiency. Any special duty assigned by the Facility Manager.

# PROTECO

Protección Técnica Ecológica

## LANDFILL SUPERVISOR

Reports to Facility Manager

Qualifications: HS graduate. Hazardous waste training. Heavy equipment driver experience.

### Duties

Provide day to day supervision and direction to the hourly employees operating the land farm activities.

Insure all employees and properly trained in both in operation and safety procedures. Insure that all employees are wearing the proper safety equipment at all times.

Understand all emergency and contingency plans and be sure employees understand them.

Recomend changes in operations and procedures to improve productivity and efficiency. Any special duty assigned by the Facility Manager.



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TECHNICAL DIRECTOR

Reports to President

Qualifications: M S in Environmental Engineering or equivalent experience in the environmental field, extensive experience in EPA, EQB and DOT regulations and TSD facility hazardous waste management procedures, sampling, training, etc.

Duties

1. Responsible of all the technical aspects within the facility for the compliance with all the requirements of the facility operational permits given by EPA and EQB.
2. Will be responsible of assuring that all the work performed with respect to TSD facilities compliance with RCRA regulations, QA/QC activities and laboratory analyses is performed in a timely and effective manner.
3. Will be responsible of making any corrective action within the facility, if necessary, to comply with EPA and EQB regulations.
4. Will perform periodic inspections to all TSD facilities and PROTECO laboratory in order to assure compliance with existing regulations, requesting to the technical staff any corrective measures, whenever needed.
5. Will give advice to PROTECO technical staff about any aspect related with hazardous waste management, whenever required.
6. Will perform other duties as assigned by the President.



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## QA/QC OFFICER

### Reports to Technical Director

Qualifications: BS in Chemistry, authorized to practice in P R as a Chemist, extensive knowledge of QA/QC procedures related with hazardous waste sampling and analysis as required by EPA.

### Duties

1. Responsible of the performance of all Quality Assurance/Quality Control activities within the facility in relation to hazardous waste sampling (including groundwater) and analysis.
2. Will be present at all hazardous waste sampling activities within the facility to assure that adequate procedures to obtain representative samples are followed in accordance with the EPA manual "Test Methods for Evaluating Solid Waste". Will work in coordination with the Compliance Officer in order to be sure that sampling-related equipment is adequately used and thoroughly decontaminated after sampling activities take place.
3. Will work in close coordination with the Facility Laboratory Director in order to assure that laboratory blank and spike samples are run. Will also assure that the laboratory follows the procedures stated in the EPA manual "Test Methods for Evaluating Solid Wastes" and facility Waste Analysis Plan during waste analysis.
4. Will verify waste analysis submitted by hazardous waste generators for their compliance with EPA requirements.
5. Will notify the Technical Director any QA/QC activity that is not being performed in order to make corrective measures.
6. Will make recommendations and give training to the personnel involved in hazardous waste sampling and analysis about correct QA/QC procedures.

# PROTECO

Protección Técnica Ecológica

## COMPLIANCE OFFICER

Reports to Technical Director

Qualifications: BS in Chemistry, authorized to practice in PR as a Chemist, extensive experience in EPA, EQB and DOT regulations and TSD facility hazardous waste management procedures, sampling, training, etc., trained to respond to hazardous waste emergencies.

## Duties

1. Responsible for the correct implementation of PROTECO Waste Analysis Plan, including sampling of wastes and hazardous waste management units within the facility, waste analysis and information requests to hazardous waste generators to utilize or want to utilize PROTECO services, waste compatibility checks in coordination with facility lab, waste movement into and within the facility, etc.
2. Responsible of all TSD facilities inspections and the determination and implementation of appropriate corrective measures. Notify the Technical Director for assistance, if necessary.
3. Be the Primary Emergency Coordinator for PROTECO when the implementation of facility Contingency Plan is needed due to an emergency situation.
4. Perform training activities to instruct the related personnel about adequate hazardous waste transportation, management and emergency response activities.
5. Perform other duties as assigned by the technical Director.

# PROTECO

## Protección Técnica Ecológica

### TECHNICAL AID

#### Reports to Compliance Officer

Qualifications: HS graduate or equivalent college background in chemistry, knowledge of EPA, EQB and DOT regulations and TSD facility hazardous waste management procedures, sampling, training, etc. trained to respond to hazardous waste emergencies.

#### Duties

1. Will help the facility Compliance Officer for the compliance of all his duties.
2. Will develop required documentation for facility personnel training activities in coordination with the Technical Director and Compliance Officer.
3. Will perform inspections to PROTECO TSD facilities in coordination with the Compliance Officer.
4. Will perform TSD facility sampling activities (including decontamination of sampling equipment) in coordination with the Compliance Officer.
5. Will develop technical reports to regulatory agencies (such as biennial reports) as requested by the Compliance Officer or Technical Director.
6. Will be an Alternate Emergency Coordinator for PROTECO when the implementation of facility Contingency Plan is needed due to an emergency situation.
7. Will help the Compliance Officer in checking incoming waste loads in order to assure compliance with existing regulations.
8. Will help the Compliance Officer in keeping facility Operations Record Log Back up-to-date, addressing any incoming load in the record as of any movement within the facility in Waste Movement Forms.

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Protección Técnica Ecológica

Technical Aid - 2

9. Will perform other duties as assigned by the Compliance Officer.

# PROTECO

Protección Técnica Ecológica

## DOCUMENTATION OFFICER

### Reports to Compliance Officer

Qualifications: HS graduate or equivalent, knowledge of EPA, EQB and DOT regulations regarding hazardous waste manifests and transportation.

### Duties

1. Will help the Facility Compliance Officer for the overall implementation of the Manifest and Waste Movement Form Systems at PROTECO.
2. Will check incoming loads to assure that waste described in labels matches the one described on manifests, notifying any discrepancy to the Compliance Officer.
3. Will check if hazardous waste manifests submitted by generators are filled correctly, i e, in accordance with related regulations.
4. Will be in charge of preparing reports to EQB about the wastes received at Facility (manifests copies to EQB).
5. Will keep an up-to-date file of hazardous waste manifests and waste movement forms.
6. Will perform other duties as assigned by the Compliance Officer.

# PROTECO

## Protección Técnica Ecológica

### LABORATORY DIRECTOR

#### Reports to Technical Director

Qualifications: MS in Chemistry or BS with equivalent experience, authorized to practice in P R as a Chemist, extensive knowledge of all procedures related with hazardous waste sampling and analysis as required by RCRA, personnel supervision experience desirable.

#### Duties

1. Will supervise all laboratory activities and personnel in order to assure that waste analysis are performed according to EPA procedures stated in the manual "Test Methods for Evaluating Solid Waste" and PROTECO waste Analysis Plan, including adequate QA/QC, chain of Custody and waste movement form procedures, and applying corrective measures whenever necessary.
2. Will notify the Technical Director about any unresolved problem that may avoid good laboratory performance.
3. Will perform routine inspections of laboratory equipment to determine anomalies and applying immediate correction.
4. Will be responsible of equipment calibration and maintenance, and of requesting necessary equipment and chemicals.

# PROTECO

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## FACILITY CHEMIST

Reports to Lab Director

Qualifications: BS in Chemistry, authorized to practice chemistry in P R, knowledge of hazardous waste laboratory analysis procedures according to RCRA.

### Duties

1. Perform hazardous waste analysis in accordance with EPA Manual "Test Methods for Evaluating Solid Waste" and PROTECO Waste Analysis Plan. This way include RCRA characterization, waste compatibility checks and determination of additives for waste stabilization/fixation.
2. Will be responsible of following adequate QA/QC procedures in performing the above described analysis including equipment calibration.
3. Will report to the Lab Director any equipment malfunction or the necessity of chemical reactives. Will perform maintenace activities related with utilized equipment.

**APPENDIX H-4**

**PERSONNEL TRAINING LOGS**

PROGRAMA DE ADIESTRAMIENTO

Adiestramiento# 3-B-86

Tema: 41 - Manual de Auto Shot  
(USDS)

Nombre	Firma	Fecha
1. Amaro, Magda		
2. Aquino, Hector		5/23/86
3. Aquino, Luis		
4. Arroyo, Angel		
5. Aviles, Alberto	Alberto Aviles	5/23/86
6. Bartolomei, Carlo		
7. Boqachica, Hiram		
8. Bartolomei, Francisco		
9. Casacuberta, Fraccisco		
10. Cedeño, Edison		
11. Centeno, Rafael	Rafael Centeno	5/23/86
12. Centeno, Rafael jr.		
13. Centeno, Ricardo	Ricardo Centeno	5/23/86
14. Cruz, Jose del CA		
15. De Jesus, Marta		
16. Fernandez, Jorge		
17. Guidicelli, Darlene		
18. Hernandez, Marta		
19. Lopez, Miguel	Miguel Lopez	23/5/86
20. Matos Pedro		
21. Morales, Flor	Osca Jones	23/5/86
22. Negron, Juan E.		
23. Negron, Victor		
24. Ocacio, Pedro J.		
25. Ramos, Indalicio	Indalicio Ramos	23/5/86
26. Rodriguez, Carlos		
27. Rodrigex, Gregorio	Gregorio Rodrigex	5/23/86
28. Rodriguez, Jose		5/23/86
29. Roubert, Julio		
30. Sanchez, Francisco		5/23/86
31. Serrano, Juan		5/23/86
32. Tirado, Ruth		

Nombre	Firma	Fecha
33. Torres, Confesor	<i>[Signature]</i>	5-23-56
34. Torres, Oscar	<i>[Signature]</i>	
35. Vargas, Humberto	<i>[Signature]</i>	Dec 22 - 1981
36. Vacquer, Ricardo		
37. Vergio, Velasquez		
38. Felipe, Vega	<i>[Signature]</i>	Dec 22 - 1981

# RESOURCE MANAGEMENT, INC.

FIRM DELIVERY  
PONCE, P.R. 00731

(CARBAREON)  
(PROTECO, INC.)

TELS. 726-3032 (S.J.)  
836-2058

## PROGRAMA DE ENTRENAMIENTO

ENTRENAMIENTO #

2

TEMA:

Regulaciones de RCRA

	NOMBRE	FIRMA	FECHA
1.	Jose Del C. Cruz	Jose D. C. Cruz	4/11/86
2.	Gregorio Rodriguez	Gregorio Rodriguez	4/11/86
3.	Hector Aquino	Hector Aquino	4/11/86
4.	Victor Negrón	Victor Negrón	4/11/86
5.	Jose Rodriguez	Jose Rodriguez	4/11/86
6.	Julio A. Robert	Julio A. Robert	4/11/86
7.	Angel Proyo	Angel Proyo	4-11-86
8.	Francisco Sanchez	Francisco Sanchez	4/11/86
9.	Rafael Centeno Rivera	Rafael Centeno Rivera	4/11/86
10.	Ricardo Centeno Aquino	Ricardo Centeno Aquino	4/11/86
11.	Fco. Bartolomei	Fco. Bartolomei	4/11/86
12.	Humberto Vazquez	Humberto Vazquez	4-11-86
13.	Felipe Ubeda	Felipe Ubeda	4-11-86
14.	Juan Soriano	Juan Soriano	4-11-86
15.	Cesar Torres	Cesar Torres	4-11-86
16.	OSCAR TORRES	Oscar Torres	4/11/86
17.	Indalecio Ramos	Indalecio Ramos	4/11/86
18.			
19.			
20.			

PROGRAMA DE ADIESTRAMIENTO

Adiestramiento# 3-86

Tema: El Manifiesto

Nombre	Firma	Fecha
1. Amaro, Magda		
2. Aquino, Hector		
3. Aquino, Luis		
4. Arroyo, Angel	<i>Angel Arroyo</i>	9/5/86
5. Aviles, Alberto	<i>Alberto Aviles</i>	9/23/86
6. Bartolomei, Carlo		
7. Bogachica, Hiram		
8. Bartolomei, Francisco		
9. Casacuberta, Fraccisco		
10. Cedeño, Edison		
11. Centeno, Rafael	<i>Rafael Centeno</i>	5/9/86
12. Centeno, Rafael jr.		
13. Centeno, Ricardo	<i>Ricardo Centeno</i>	5/9/86
14. Cruz, Jose del C.	<i>Jose del C. Cruz</i>	9/8/86
15. De Jesus, Marta		
16. Fernandez, Jorge		
17. Guidicelli, Darlene		
18. Hernandez, Marta		
19. Lopez, Miguel	<i>Miguel Lopez</i>	5/23/86
20. Matos Pedro		
21. Morales, Flor	<i>Flor Morales</i>	5/23/86
22. Negron, Juan E.		
23. Negron, Victor	<i>Victor Negron</i>	
24. Ocacio, Pedro J.		
25. Ramos, Indalicio	<i>Indalicio Ramos</i>	
26. Rodriguez, Carlos		
27. Rodriguez, Gregorio	<i>Gregorio Rodriguez</i>	5/9/86
28. Rodriguez, Jose	<i>Jose Rodriguez</i>	5/23/86
29. Roubert, Julio		
30. Sanchez, Francisco	<i>Francisco Sanchez</i>	5/23/86
31. Serrano, Juan	<i>Juan Serrano</i>	5/9/86
32. Tirado, Ruth		

Nombre	Firma	Fecha
33. Torres, Confesor	<i>Confesor Torres</i>	5/12/86
34. Torres, Oscar		
35. Vargas, Humberto	<i>Humberto Vargas</i>	11/23 - 1986
36. Vacquer, Ricardo	<i>Ricardo Vacquer</i>	9 Mayo 1986
37. Sergio, Velasquez	<i>Sergio Velasquez</i>	
38. Felipe, Vega	<i>Felipe Vega</i>	5/12/86

# TRANSPORTATION SKILLS PROGRAMS



TRANSPORTATION SKILLS PROGRAMS, INC.

This is to certify that Mayda Amaro  
has successfully completed the

TSP Hazardous Materials, Classification, and Waste Management and  
Compliance Seminar

in a sincere effort to comply with the  
mandatory and annual training requirements of  
the U.S. Department of Transportation, the  
Environmental Protection Agency, and the  
Occupational Safety and Health  
Administration.



Robert J. Keegan  
Robert J. Keegan, President

# TRANSPORTATION SKILLS PROGRAMS

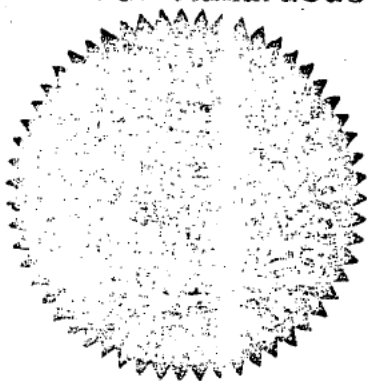


**TRANSPORTATION SKILLS PROGRAMS, INC.**

This is to certify that *Juan Enrique Negrón*  
has successfully completed the

**TSP Hazardous Materials, Chemicals, and Waste Management and Compliance Seminar**

In a sincere effort to comply with the mandatory and annual training requirements of the U.S. Department of Transportation, the Environmental Protection Agency, and the Occupational Safety and Health Administration.



*Robert J. Keegan*  
Robert J. Keegan, President